iDaq User Manual

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CONTENTS

ABOUT THIS MANUAL **9**

CONVENTIONS 9

PREFACE **11**

ABOUT THIS MANUAL 11

REQUIREMENTS **11**

MINIMUM HARDWARE REQUIREMENTS 11

MINIMUM SOFTWARE REQUIREMENTS 11

INSTALLATION **12**

GETTING STARTED WITH IDAQ **13**

IDAQ MAIN WINDOW 13

CONFIGURATION 14

CONFIGURING ACQUISITION DEVICE 14

CONFIGURING SIGNALS 16

Analog input signals table *16*

Signals Calibration 17

Counter input signals *18*

Linear position channels Calibration 19

Angular channels Calibration 20

Pulses counter channels Calibration 22

Pulses counter channels Calibration 23

Virtual signals table *24*

Digital input lines *27*

Digital output lines *28*

General *29*

LOG WINDOW 30

GENERAL SETTINGS: OPTIONS 31

General projects settings *31*

Data distribution *32*

Factory settings *33*

Data distribution advising signals *34*

ADD-ONs *35*

MONITORING DIGITAL I/O **36**

DIGITAL INPUTS MONITOR WINDOW 36

DIGITAL OUTPUTS MONITOR WINDOW 37

CHARTS **38**

INTRODUCTION 38

STRIP CHART 38

Getting started with a Strip chart *38*

Configuring acquisition channels *39*

Signal filtering *40*

Data view *41*

XY CHARTS 42

Getting started with XY charts *42*

Configuring acquisition channels *42*

Data view *43*

RECORDING 44

TRIGGERS 44

How triggers work *45*

Armed triggers *45*

TRIGGER GROUPS 46

TRIGGER TYPES 47

Crossing a selected analog value *47*

Analog value in/out of range *47*

Selected time(s) *48*

Elapsed time(s) *50*

Digital line change *50*

Digital outputs *51*

Arm/Disarm triggers *52*

Setting triggers *52*

EXPORTING DATA 54

PROJECTS **56**

NEW PROJECT 56

PROTECTING PROJECTS 56

SAVING CURRENT PROJECTS 57

CLOSING CURRENT PROJECTS 57

PROTECTION 58

LOCKING IDAQ 58

APPENDX A: ADVISING SIGNALS LEGEND 60

Main Idaq Window 60

Simple chart window and X-Y chart window 60

FIGURE INDEX 61

INDEX 65

About this Manual

Conventions

The following conventions appear in this manual:

▸	The ▸ symbol leads you through nested menu items and dialog box options to a final action. The sequence **Tools** ▸ **Options** directs you to pull down the **Tools** menu, select **Options** item.
Bold	Bold text denotes items that you must select or click on the software, such as menu items and dialog box options. Bold text also denotes parameter names.
italic	Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.
`monospace`	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and code excerpts.

`monospace italic`

Italic text in this font denotes text that is a placeholder for a word or value that you must supply.

PREFACE

iDaq is a general purpose data logger capable to acquire, store and analyze data coming from National Instruments acquisition devices. These devices can be connected to a computer through different types of interfaces: USB, PC, PCI Express, Ethernet. iDaq uses one acquisition device at a time. If you have more than one acquisition device connected at the same time to the computer, iDaq let you choose the one you want to use to acquire signals. In order to get more details refer to *Configuring acquisition Device* section.

ABOUT THIS MANUAL

This manual has been prepared to help you to remove all your doubts about iDaq using. Use it to familiarize yourself with iDaq: it contains a lot of examples to teach you step by step all about his features and applications. Throughout each example, you will find illustrations giving information about the concepts explained in that step. It is divided in three parts:

- **INSTALLING IDAQ:** This section describes the minimum requirements for installing and using iDaq. The user has to know how to install and configure National Instruments acquisition devices in order to succeed in using this section.
- **CONFIGURING IDAQ:** This section describes how to configure an acquisition device and arrange necessary general settings for a correct program working.
- **RUNNING IDAQ:** This section describes features, functions and application cases of iDaq. There are a few examples of how to use iDaq in order to help the user to understand how iDaq works. A basic knowledge of electrical signal theory is recommended for a correct use of iDaq.

REQUIREMENTS

In this section are listed requirements that users must have in order to install and use iDaq properly. It is strongly recommended to check them out before starting iDaq installation.

MINIMUM HARDWARE REQUIREMENTS

Ensure that your computer fulfill the following hardware requirements:

- Dual core CPU (quad core CPU is suggested)
- 2 GB RAM (4 GB is strongly recommended)
- display resolution 1024x768 or higher
- 200 MB free space on disk required by iDaq
- about 800 MB free space on disk required by National Instruments device drivers
- mouse or other pointing device

MINIMUM SOFTWARE REQUIREMENTS

Ensure that your computer fulfill the following software requirements:

- OS: Windows XP+SP3 or Win 7
- National Instruments device's drivers rel 9.3.x or higher. You can download a free copy of the proper device driver for your acquisition device at www.ni.com.

INSTALLATION

This section guides you step-by-step through the installation process and introduces you to the first use of iDaq. Before installing iDaq you have to install and configure the National Instruments acquisition device. Check your acquisition device with the National instruments software *Measurement & Automation* you can find in the NI drivers CD-ROM. After having done it, you can start the guided installation. IDaq is distributed as a ZIP file. Extract iDaq files into a temporary folder and run installation wizard **setup.exe.**

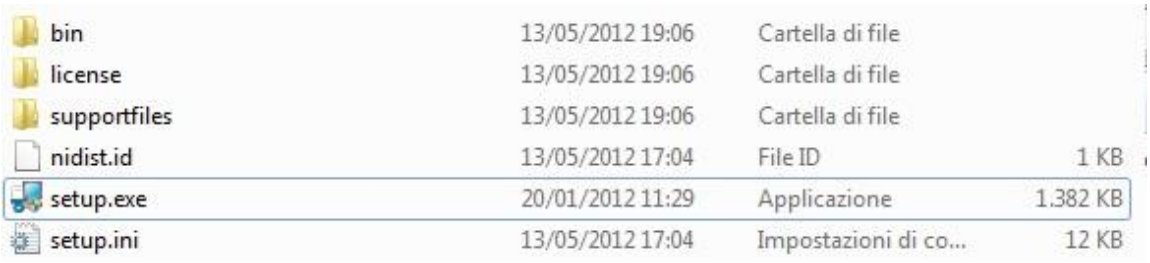
bin 13/05/2012 19:06 Cartella di file
license 13/05/2012 19:06 Cartella di file
supportfiles 13/05/2012 19:06 Cartella di file
nidist.id 13/05/2012 17:04 File ID 1 KB
setup.exe 20/01/2012 11:29 Applicazione 1.382 KB
setup.ini 13/05/2012 17:04 Impostazioni di co... 12 KB

FIGURE 1 - INSTALLING IDAQ

After having clicked it, this window will appear:

FIGURE 2 - IDAQ INSTALLATION WIZARD WINDOW

Follow the guided procedure till the end of the installation.

GETTING STARTED WITH IDAQ

To run iDaq use its link created on desktop or from Windows **Start** menu:

Start ▸ All programs ▸ TOOLS for SMART MINDS ▸ iDaq ▸ iDaq.

At the first time iDaq may take a little longer time to open its main window: that's because it's creating default folders in order to store log files.

IDAQ MAIN WINDOW

The following image represents the iDaq main window, as it is when there's no device connected:

FIGURE 3 - IDAQ MAIN WINDOW: ACQUISITION MODE OFF

Let's explain about the objects you can find in it, starting from the left to the right:

1. **Device name & Product type:** The eight fields indicated in the image before with 1, 1.1, 1.2 and so on show a list of all the connected devices, their names and their status. In facts, once a device has been connected and configured, five indicators give you information about *Analog Input/Output, Digital Input/Output and Counter input status*, according to their color (either **green** if they are ON, **grey** if they are not activated in the device settings or **red** if they are OFF), as you can see in the representation of the iDaq main window at the bottom of this page. Take a look at the **Configuring acquisition devices** section to get more informations about devices status.
2. **Recording sessions counter:** This field is a useful reminder of how many recording sessions are being in progress in the actual project.
3. **IP Address indicator:** If you place the mouse pointer over it, this field reports current IP Address and machine name.
4. **Task count:** The task count represents the amount of charts you've used during this project.

The following figure represents the iDaq main window when a device has been configured and the acquisition indicator have switched to the ON mode.

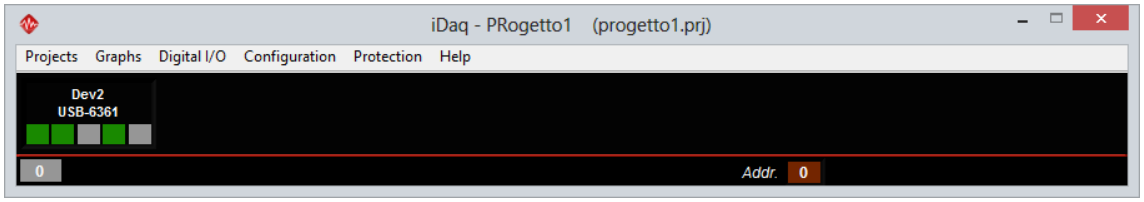

FIGURE 4 - IDAQ MAIN WINDOW: ACQUISITION MODE ON

CONFIGURATION

This section explains about all the items you can find in the “Configuration” drop-down menu. Check the Configuration list before starting your work: in this way you can take advantage of all the services iDaq offers you without problems.

CONFIGURING ACQUISITION DEVICE

First of all, ensure that your acquisition device is correctly configured. Starting from the iDaq main window, click on **Configuration ▸ Device** or simply press **F4**. If you have already connected your acquisition device to the computer, the “Device selection” window will appear like this:

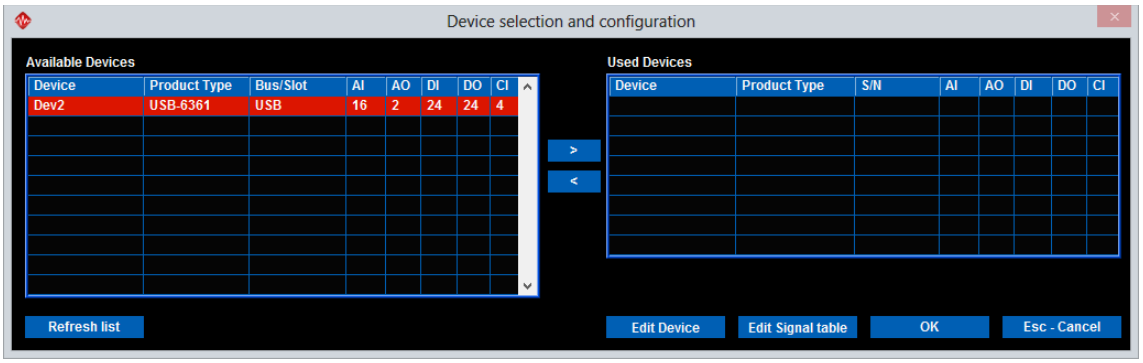

FIGURE 5 - DEVICE SELECTION WINDOW

The device selection window, as you can see, provides you with two tables: the *Available Devices table* and the *Used Devices table,* which shows you the list of devices you’re actually using and with which you can interact. If you have several acquisition devices connected at the same time, iDaq allows you to switch from one to another or simply use more than one at the same time, according to your needs. Choose the devices you want from the *Available devices* table and transfer them in the *Used Devices* one only by clicking on the **Right arrow button** in the middle of the window. If you can’t find the device you’re looking for, click on the “Refresh list” button and it will appear in a few seconds.

The next image represents how the iDaq main window change according to Used Devices list:

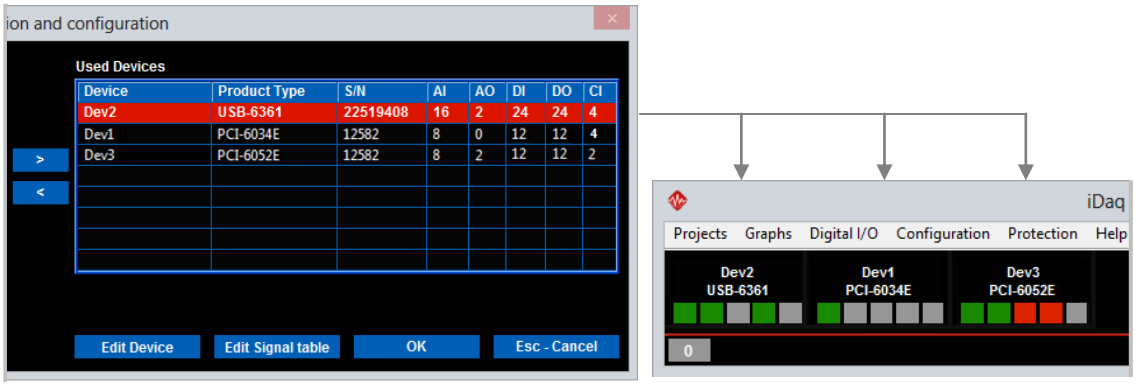

FIGURE 6 ADDING DEVICES TO THE USED DEVICES LIST

Once the desired device has been put into the *Used Devices* table, you can rapidly check a list of settings regarding that in the *Device settings window* by clicking on the **"Edit device" button.**

As you can see, you can set Voltage range, set a limit to Analog input channels and sampling rates and so on. In particular, take a look at the **Acquire digital input lines** and **Enable digital output lines** check-boxes: checking and configuring them with the **Configure** button, you let iDaq receive both digital inputs and outputs.

If these fields aren't checked, the digital input/output status indicators in the main window become **grey**, if checked they become **green** or **red** according to digital data arriving or not.

The next figure represents the Device settings window:

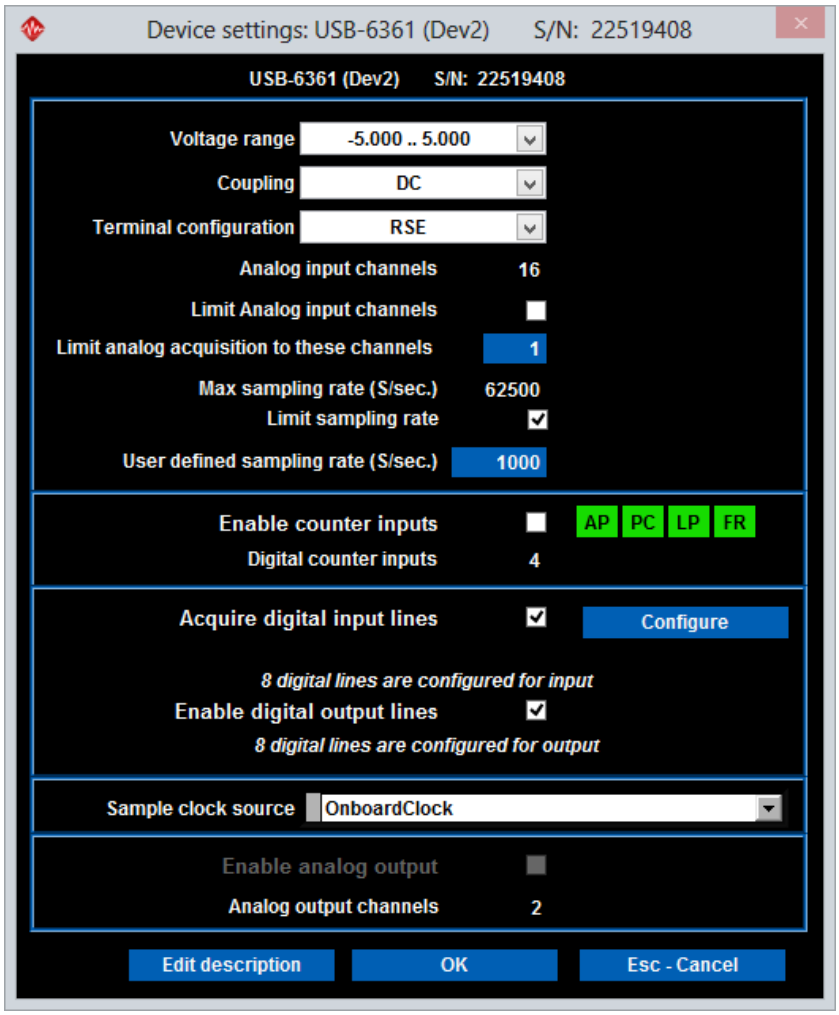

FIGURE 7 DEVICE SETTINGS WINDOW

Click the **OK button** to save all your changes or Esc to invalidate them.

CONFIGURING SIGNALS

iDaq gives you the possibility of checking your signals values in a very fast way. Click on **Configuration** ▸ **Device** or simply press **F4** to open the "Device Configuration" window.

Here there is the **Edit Signal table** button, as the next figure shows, which opens the **Current signal window**.

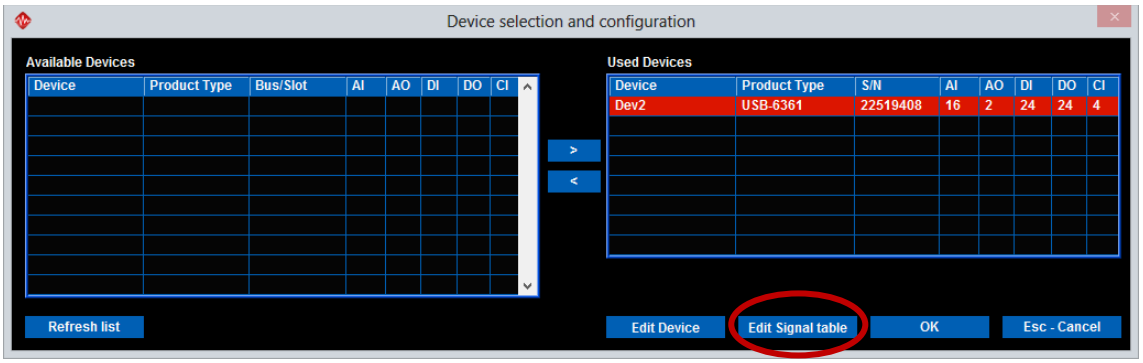

FIGURE 8 HOW TO OPEN THE CURRENT SIGNAL TABLE

This window gives you several tables showing different types of signals provided with their description and values: you will be introduced to them in detail in the next six sub-chapters.

ANALOG INPUT SIGNALS TABLE

By default the Current signal window first opens the Analog input signals table.

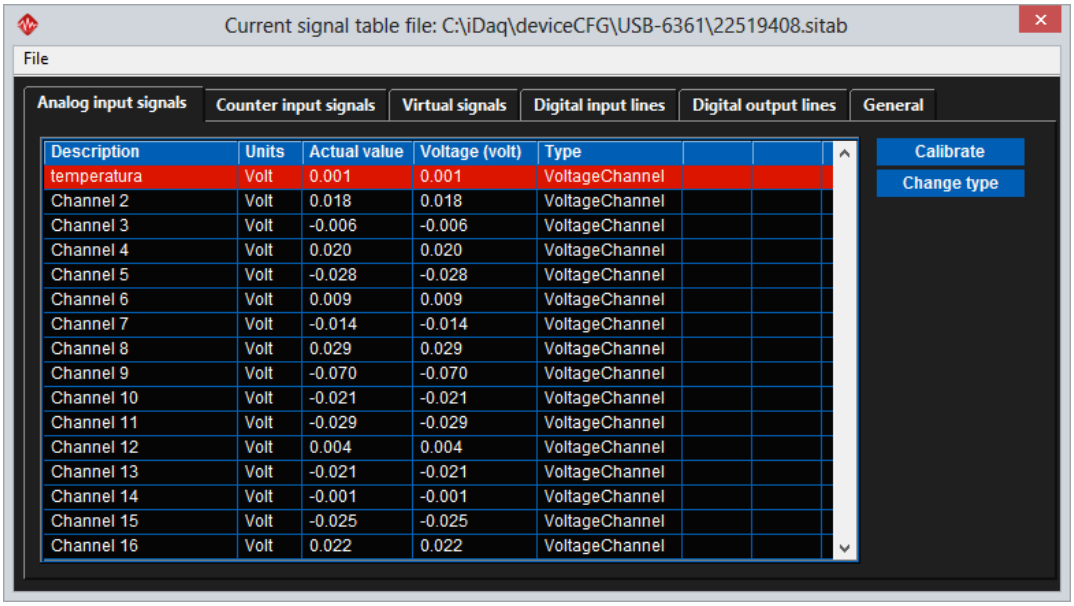

FIGURE 9 ANALOG INPUT SIGNALS TAB

This table allows you to real-time analyse at a glance the values of every channel your acquisition device has got and compare them in a very rapid way. If you double click on one of these channels, this opens a little *Channel editor* window, in which you can rename your channel, define a range giving a minimum and maximum value and give a unit of measurement. You can also calibrate your channel by clicking on the **Calibrate** button.

SIGNALS CALIBRATION

iDaq gives you the possibility of converting the input (Volts) of the acquisition device into polynomial physical quantities (up to quarter polynomials). You can insert polynomial coefficients or define by yourself points that calculate the coefficients approximation. Through the indication of those reference points, iDaq can find the appropriate function for representing your signals: in order to calculate coefficients iDaq uses the "Ordinary Least Squares" method (OLS).

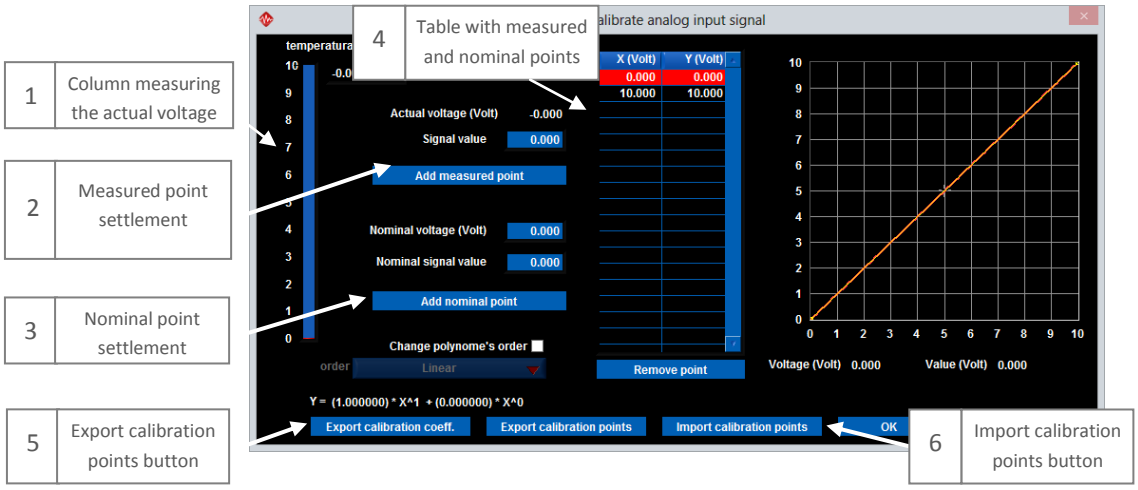

FIGURE 10 - CALIBRATE ANALOG DATA

The Calibrate Signals window has:

1. *Column;* on the left, which represents you the actual voltage measured. According to it you can enter a corresponding signal value [point 2 or 3] and, after having added it [point 4], you can see it represented in the chart on the right.
2. *Measured point settlement;* defined by Y = Actual voltage value (only volts) and X= Signal value (it can be a voltage, temperature, pressure…)
3. *Typed point settlement;* defined by Y= Nominal voltage value (irrespective of the measured voltage) and X= Nominal signal value. This function allows you to add arbitrary points to the calibration function.
4. *Table with measured and nominal points;* includes both nominal and measured points needed for calculating the calibration function.

Note that it is also possible to export and import function coefficients through their dedicated buttons (points 5 and 6 in the image above). In this way you can easily create a chart representing the ratio of voltage value to signal value.

COUNTER INPUT SIGNALS

iDaq allows you to monitor your counter input signals, if your device is equipped of them, by clicking on the **Counter input signals tab** represented in the next image**:**

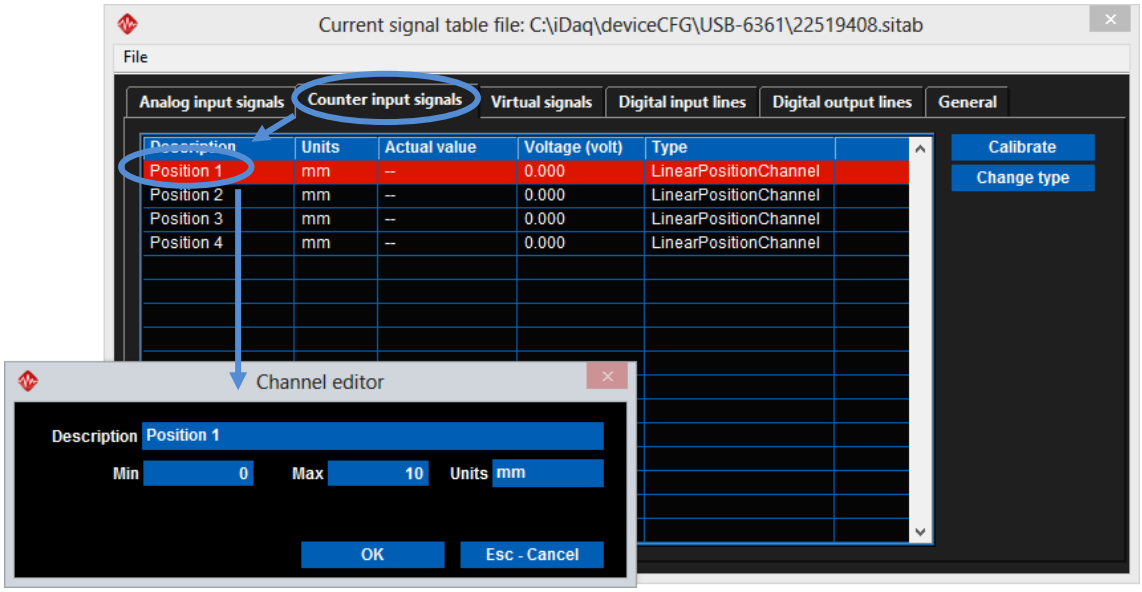

FIGURE 11 COUNTER INPUT SIGNALS TAB

Double clicking on signals allows you to open the **Channel editor window**, as said before, where you can define a *name*, a *range* of values and a *unit of measurement*.

At the right side of the window, you have two buttons:

- The **Change type button** which allows you to open the **Sensor type selection** window and choose the Sensor type you do prefer.

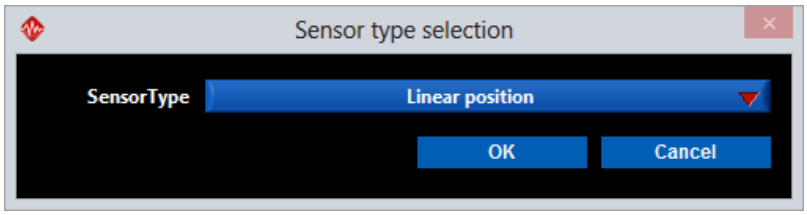

FIGURE 12 SENSOR TYPE SELECTION WINDOW

Once you have selected the sensor type, you can see it in the **Type** column.

- The **Calibrate button** allows you to calibrate your counter input signals. Calibration modalities change according to the **Signal type:** the next free subchapters describe how to calibrate different types of signals and show the several tools iDaq gives you to do it in the best way.

LINEAR POSITION CHANNELS CALIBRATION

iDaq gives you the possibility of calibrating the linear inputs (measured in mm) of the acquisition device, thanks to the following tools:

1. *Real-time values column*, on the left, represents you the actual value in mm measured as it changes time by time. Other than this graphic representation of the data stream in the column, you have an *Actual value indicator* on the right of the column showing the just registered value in numbers.
2. *Z index enable* check box, on the right, gives you the possibility either of receiving your data in a linear data stream from 0 to infinite (if *Z Index Enable* is unchecked), or of establishing a Zero index based array of which you can define the Zero index value (if *Z Index Enable* is checked).
3. *Z index phase:* specifies the states at which signal A and signal B must be while signal Z is high for NI-DAQmx to reset the measurement. If signal Z is never high while signal A and signal B are high, for example, you must choose a phase other than **A High B High**. When signal Z transitions to high and how long it stays high varies from encoder to encoder. Refer to the documentation for the encoder to determine the timing of signal Z with respect to signal A and signal B.
4. *Distance per pulse:* is the distance to measure for each pulse the encoder generates on signal A or signal B. This value is in the units you specify with the **units** input.
5. *Initial position:* is the position of the encoder when you begin the measurement. This value is in the units you specify with the **units** input.
6. *Decoding type:* specifies how to count and interpret the pulses the encoder generates on signal A and signal B. **X1**, **X2**, and **X4** are valid for quadrature encoders only. **Two Pulse Counting** is valid only for two-pulse encoders. X2 and X4 decoding are more sensitive to smaller changes in position than X1 encoding, with X4 being the most sensitive. However, more sensitive decoding is more likely to produce erroneous measurements if vibration exists in the encoder or other noise exists in the signals.

Decoding Type	Description
X1	If signal A leads signal B, count the rising edges of signal A. If signal B leads signal A, count the falling edges of signal A.
X2	Count the rising and falling edges of signal A.
X4	Count the rising and falling edges of signal A and signal B.

The next image represents the Calibrate linear position window and the points just explained:

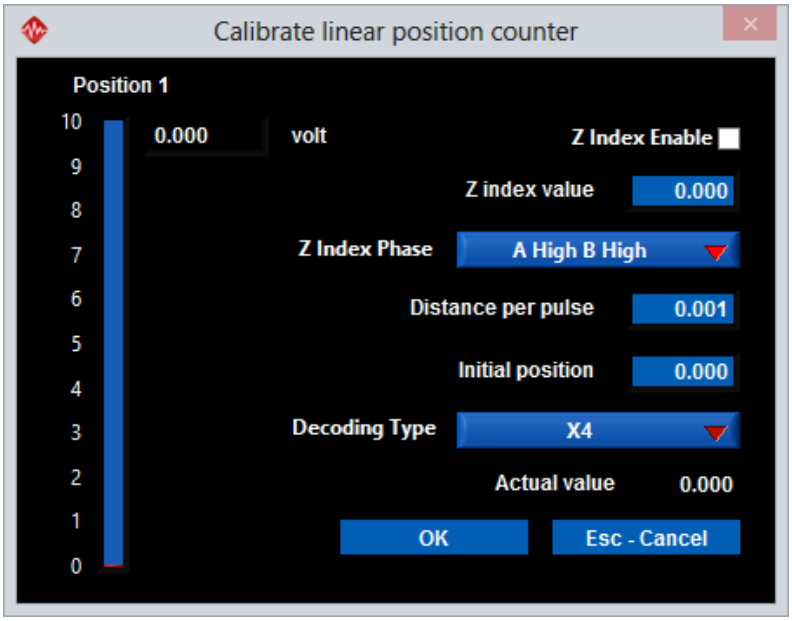

FIGURE 13 CALIBRATE LINEAR POSITION COUNTER WINDOW

Once you have set the signal calibration in the way you prefer, press the **OK** button to save the changes you've done or **Esc** to delete them all.

ANGULAR CHANNELS CALIBRATION

If the channel you are calibrating is an angular one, iDaq has elaborated for you the *Calibrate angular position counter* window. In this window you have:

1. *Graphic representation of angular position value*, which real-time illustrates data coming, together with an *Actual value indicator* which provides you with the just received position value.
2. *Z index enable* check box: it gives you the possibility either of receiving your data in a linear data stream from 0 to infinite degrees (if *Z Index Enable* is unchecked), or of establishing a Zero index based array, which makes the stream to restart from 0 every 2π revolutions (if *Z Index Enable* is checked).
3. *Pulses per revolution* field: it indicates digital pulses to complete a revolution.
4. *Initial angle* field is the starting angle of the encoder. This value is in the units you specify with the **units** input.
5. *Z index value* field specifies in **units** the value to which to reset the measurement when signal Z is high and signal A and signal B are at the states you specify with **z index phase**.
6. *Units*: specifies the units to use to return angular position measurements from the channel.
7. *Decoding type:* specifies how to count and interpret the pulses the encoder generates on signal A and signal B. **X1**, **X2**, and **X4** are valid for quadrature encoders only. **Two Pulse Counting** is valid only for two-pulse encoders. X2 and X4 decoding are more sensitive to smaller changes in

position than X1 encoding, with X4 being the most sensitive. However, more sensitive decoding is more likely to produce erroneous measurements if vibration exists in the encoder or other noise exists in the signals.

Decoding Type	Description
X1	If signal A leads signal B, count the rising edges of signal A. If signal B leads signal A, count the falling edges of signal A.
X2	Count the rising and falling edges of signal A.
X4	Count the rising and falling edges of signal A and signal B.

8. *Z index phase:* specifies the states at which signal A and signal B must be while signal Z is high for NI-DAQmx to reset the measurement. If signal Z is never high while signal A and signal B are high, for example, you must choose a phase other than **A High B High**. When signal Z transitions to high and how long it stays high varies from encoder to encoder. Refer to the documentation for the encoder to determine the timing of signal Z with respect to signal A and signal B.

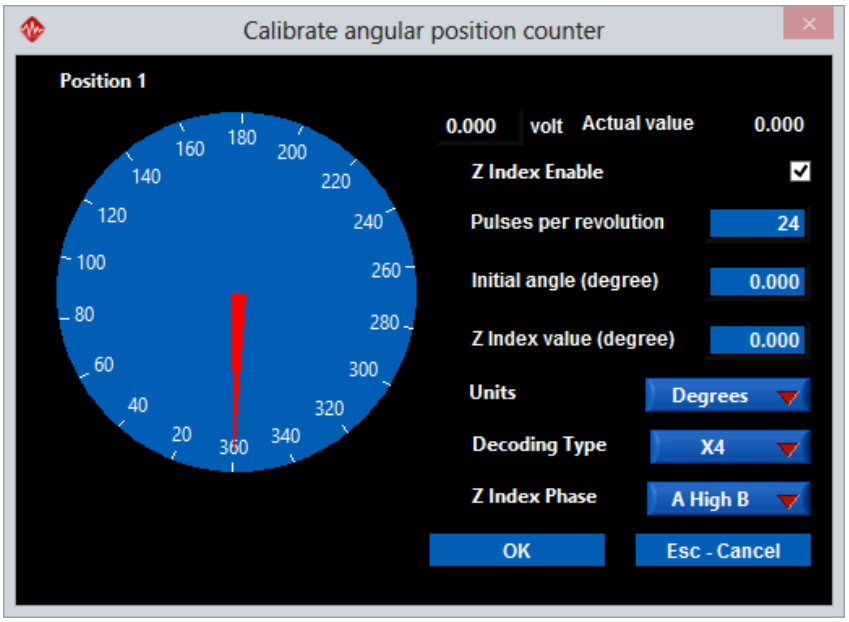

FIGURE 14 CALIBRATE ANGULAR POSITION COUNTER WINDOW

Once you have set the signal calibration in the way you prefer, press the **OK** button to apply the changes you've done or **Esc** to delete them all.

PULSES COUNTER CHANNELS CALIBRATION

If the channel you are calibrating is a pulse counter one, iDaq provides you with the *Calibrate pulse counter* window. In this window you have:

1. *Real-time voltage values column*, on the left, which represents you the actual value in volts measured as it changes time by time. Other than this graphic representation of the data stream in the column, you have an *Actual voltage indicator* on the right showing the just registered value in numbers.
2. *Initial count* field: it indicates the value you want to use as pulse count starter.
3. *Count direction* field: it indicates the direction you want to establish for your pulse count.
4. *Edge* field: it indicates the kind of edge the pulse counter must have between rising and falling edge.

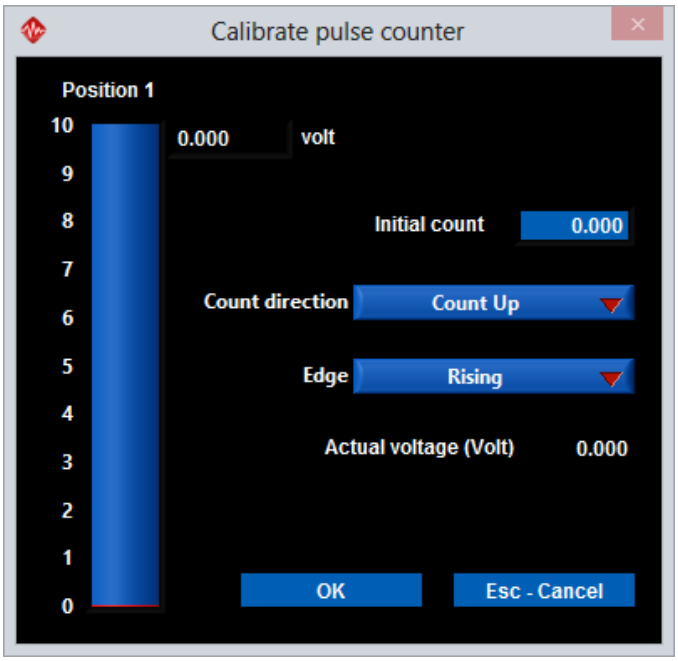

FIGURE 15 CALIBRATE PULSE COUNTER CALIBRATION WINDOW

Once you have set the signal calibration in the way you prefer, press the **OK** button to apply the changes you've done or **Esc** to delete them all.

PULSES COUNTER CHANNELS CALIBRATION

If the channel you are calibrating is a frequency measuring one, iDaq has elaborated for you the *Calibrate frequency measure* window. In this window you have:

1. *Real-time frequency values column*, on the left, which represents you the actual value of the frequency measured as it changes time by time. Other than this graphic representation of the data stream in the column, you have an *Actual frequency indicator* on the right of the column showing the just registered value in numbers.
2. *Unit of measure* field: Select here the unit of measurement you prefer between either Hertz, Ticks or a measure from Custom scale.
3. *Edge* field: it indicates the kind of edge the pulse counter must have between rising and falling edge.

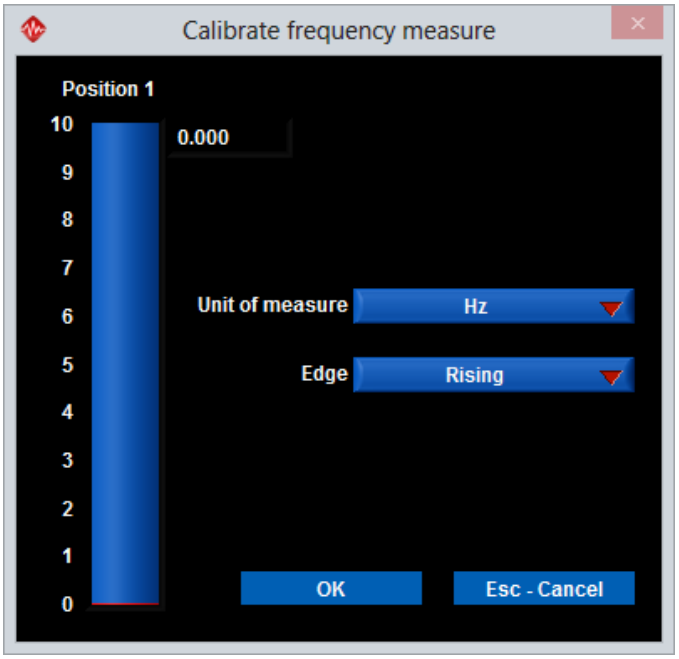

FIGURE 16 CALIBRATE FREQUENCY MEASURE CHANNELS WINDOW

Once you have set the signal calibration in the way you prefer, press the **OK** button to apply the changes you've done or **Esc** to delete them all.

VIRTUAL SIGNALS TABLE

Click on the Virtual signals tab, iDaq allows you to supervise your virtual channels: you can create them by clicking on the **Add** button.

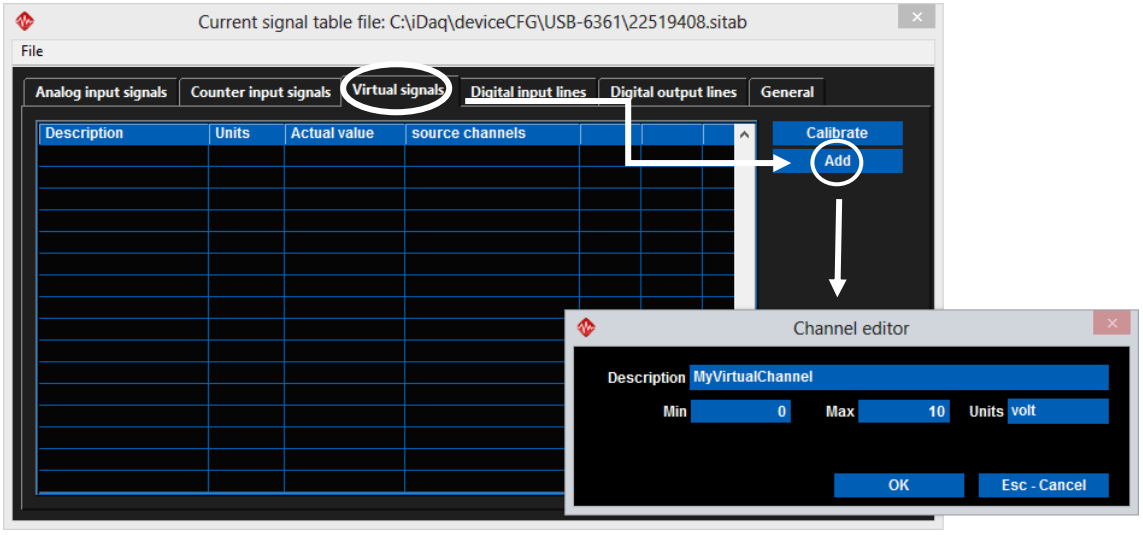

FIGURE 17 - ADDING A VIRTUAL SIGNAL

Once you have typed in a Signal *description*, a reference *range* value and a *unit of measurement*, press the **OK** button: it automatically opens the **Virtual channel calibration** window you can see in the next image.

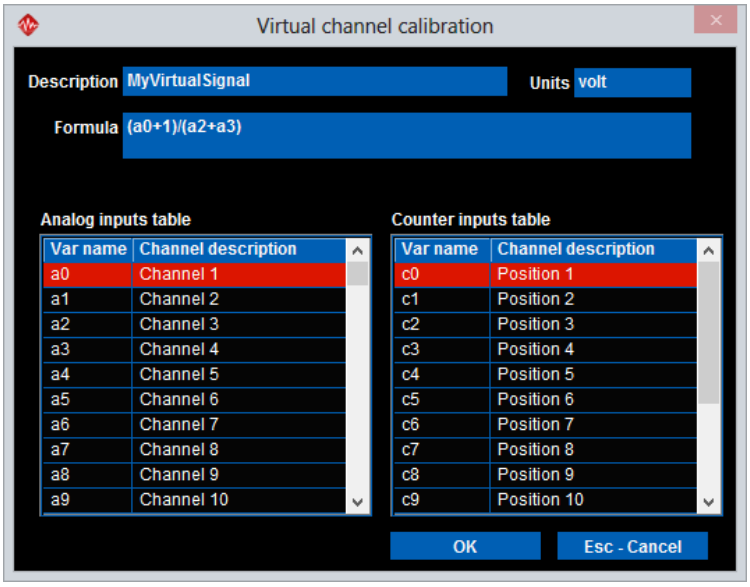

FIGURE 18 VIRTUAL CHANNEL CALIBRATION WINDOW

The **Formula field** allows you to specify the relation you want to establish between the different channels, as explained in the example above. Use the *Var names* indicated in the *Analog input* and *Counter input tables* corresponding to the channels you want to use in the formula.

NOTE:

The **Formula field** *is case sensitive and therefore the channels you are going to insert within it* ***must*** *have the first character in lower case; while parameters and operators must follow the syntax as suggested in the next table.*

The following table represents a list of the operators and functions useful in creating virtual channels.

Function / Operator	Description
+	Addition.
-	Subtraction.
*****	Multiplication.
/	Division.
^	Power.
(	Left parenthesis.
)	Right parenthesis.
E	Enters E into the formula, where E represents the power of 10 exponent.
abs(x)	Returns the absolute value of *x*.
asin(*x*)	Computes the inverse sine of *x* in radians.
asinh(*x*)	Computes the inverse hyperbolic sine of *x*.
atan(*x*)	Computes the inverse tangent of *x* in radians.
atanh(*x*)	Computes the inverse hyperbolic tangent of *x*.
ceil(*x*)	Rounds *x* to the next higher integer (smallest integer *x*).
cos(*x*)	Computes the cosine of *x*, where *x* is in radians.

cosh(*x*)	Computes the hyperbolic cosine of *x*.
cot(*x*)	Computes the cotangent of *x* (1/tan(*x*)), where *x* is in radians.
csc(*x*)	Computes the cosecant of *x* (1/sin(*x*)), where *x* is in radians.
exp(*x*)	Computes the value of *e* raised to the *x* power.
expm1(*x*)	Computes one less than the value of *e* raised to the *x* power ((*e*^*x*) – 1).
floor(*x*)	Truncates *x* to the next lower integer (largest integer *x*).
getexp(*x*)	Returns the exponent of *x*.
getman(*x*)	Returns the mantissa of *x*.
int(*x*)	Rounds *x* to the nearest integer.
intrz(*x*)	Rounds *x* to the nearest integer between *x* and zero.
ln(*x*)	Computes the natural logarithm of *x* (to the base of *e*).
lnp1(*x*)	Computes the natural logarithm of (*x* + 1).
log(*x*)	Computes the logarithm of *x* (to the base of 10).
log2(*x*)	Computes the logarithm of *x* (to the base of 2).
rand( )	Produces a floating-point number between 0 and 1 exclusively.
sec(*x*)	Computes the secant of *x*, where *x* is in radians (1/cos(*x*)).
sign(*x*)	Returns 1 if *x* is greater than 0, returns 0 if *x* is equal to 0, and returns –1 if *x* is less than 0.
sin(*x*)	Computes the sine of *x*, where *x* is in radians.
sinc(*x*)	Computes the sine of *x* divided by *x* (sin(*x*)/*x*), where *x* is in radians.
sinh(*x*)	Computes the hyperbolic sine of *x*.
sqrt(*x*)	Computes the square root of *x*.
tan(*x*)	Computes the tangent of *x*, where *x* is in radians.
tanh(*x*)	Computes the hyperbolic tangent of *x*.

DIGITAL INPUT LINES

Click on the **Digital input lines tab** to see the corresponding table.

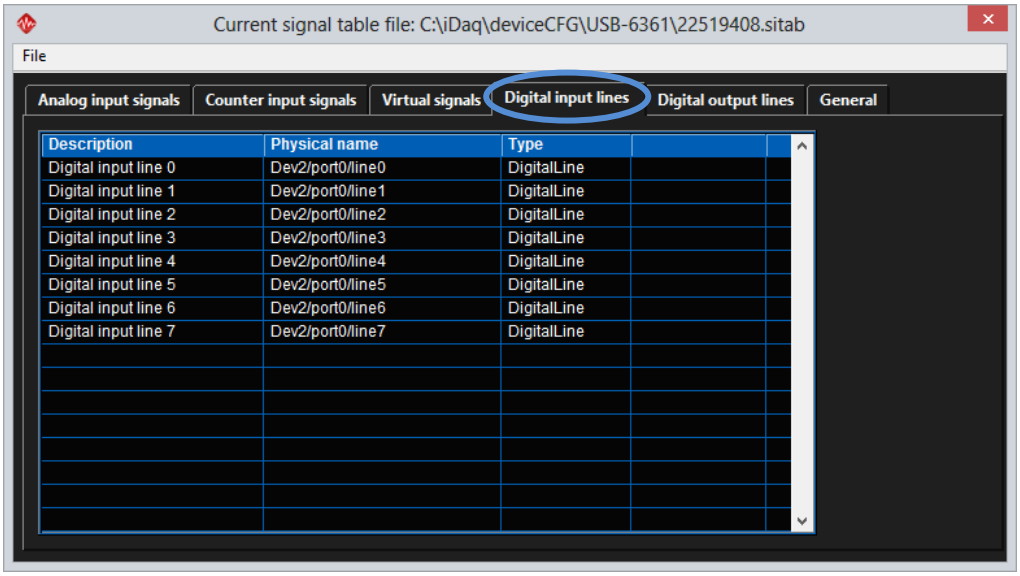

FIGURE 19 DIGITAL INPUT LINES TAB IN CURRENT SIGNAL TABLE

In this table there are three columns:

- *Description* column**:** Here you can insert a name, for example describing what this channel is used for. You can change it to your liking by double clicking on the channel you want and opening a digital line editor where you can type in the name you want for that channel.
  The next image represents the Digital line editor:

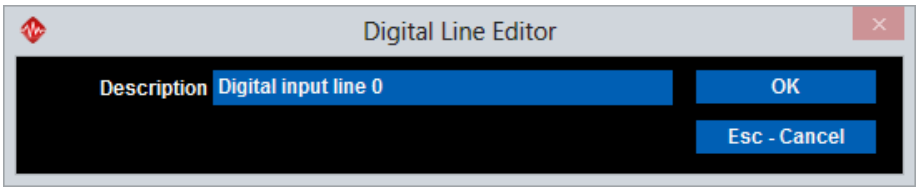

FIGURE 20 DIGITAL INPUT LINES EDITOR

- *Physical name* field: Is the line name as indicated on the NI device.
- *Type* field: Indicates digital line type.

DIGITAL OUTPUT LINES

Click on the **Digital output lines tab** to see the corresponding table.

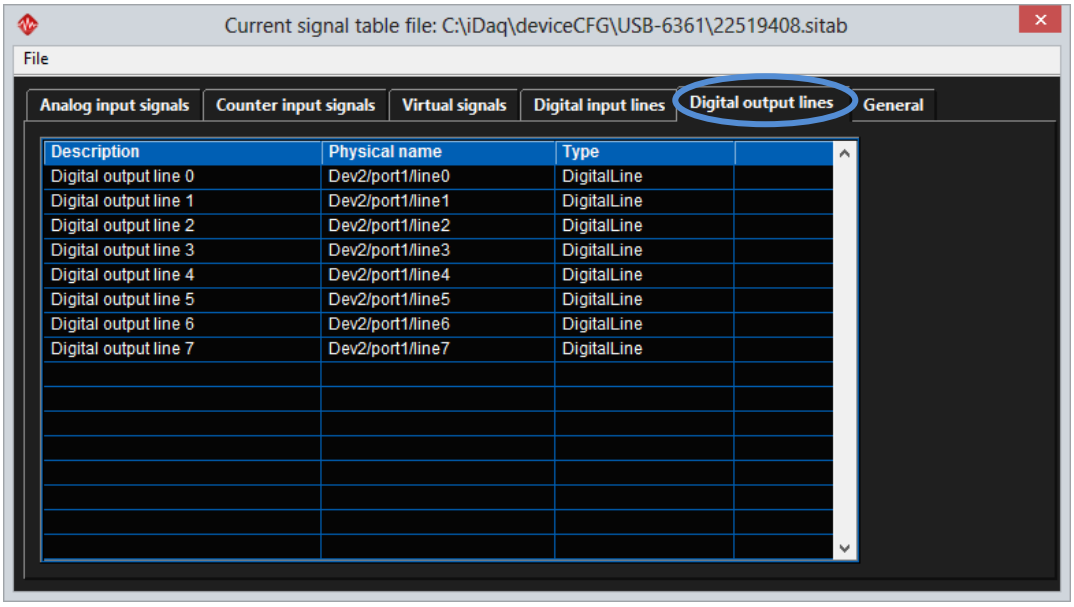

FIGURE 21 DIGITAL OUTPUT LINES TAB IN CURRENT SIGNAL TABLE

In this table there are three columns:

- *Description* column**:** Here you can insert a name, for example describing what this channel is used for. You can change it to your liking by double clicking on the channel you want and opening a digital line editor where you can type in the name you want for that channel.
  The next image represents the Digital line editor:

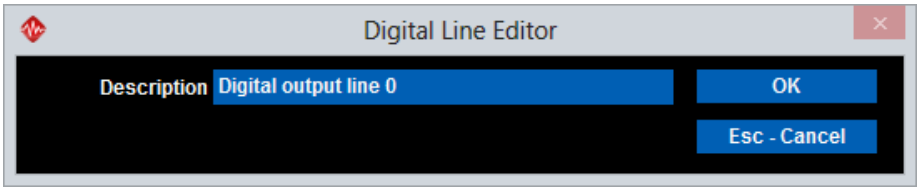

FIGURE 22 DIGITAL OUTPUT LINES EDITOR

- *Physical name* field: Is the line name as indicated on the NI device.
- *Type* field: Indicates digital line type.

GENERAL

The last tab in the *Current signal table* gives you an helpful field where you can type in a description of your project, take notes of fundamental aspects of your work. The general description field allows you to keep you notes always handy because you find them every time you open iDaq.
iDaq automatically saves all the observations you type in the Description field.

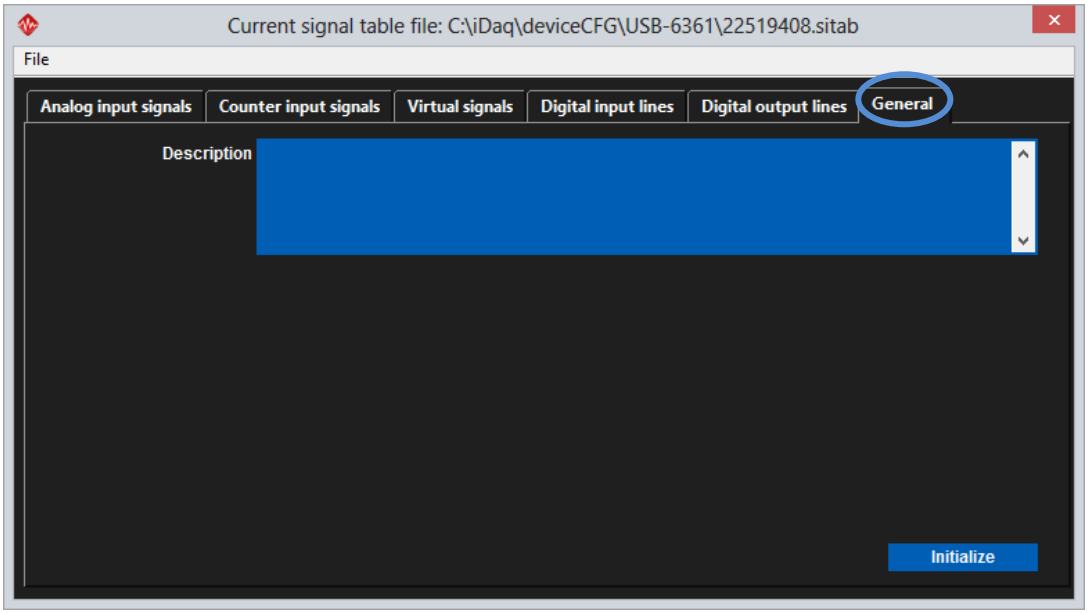

FIGURE 23 GENERAL TAB IN CURRENT SIGNAL TABLE

On the right side down in this window you can find the **Initialize** button. Clicking this button means that you ask iDaq to reset all the settings you have changed to the original factory ones. For security's sake iDaq asks once more if you are sure to proceed in initializing the signal table, as the following image shows:

iDaq Message
Do you want to initialize signal table to factory settings? Initializing signal table discards all settings you have made. Do you want to proceed anyway?
Enter - OK
Esc - Cancel

FIGURE 24 INITIALIZING SIGNAL TABLE

Click **OK button** if you are sure to reset, otherwise click **Esc button**.

LOG WINDOW

The Log window gives you a chronology of all the events iDaq keeps track since has been started. Log window shows events grouped in different sources:

- System: events related to iDaq main functionality.
- Project: events related to user action on projects such open, edit and close.
- Data acquisition: events related to acquisition device such configuration changes.

Click on **Configuration ▸ Open Log window** from iDaq menu or press **F6** to open log window.

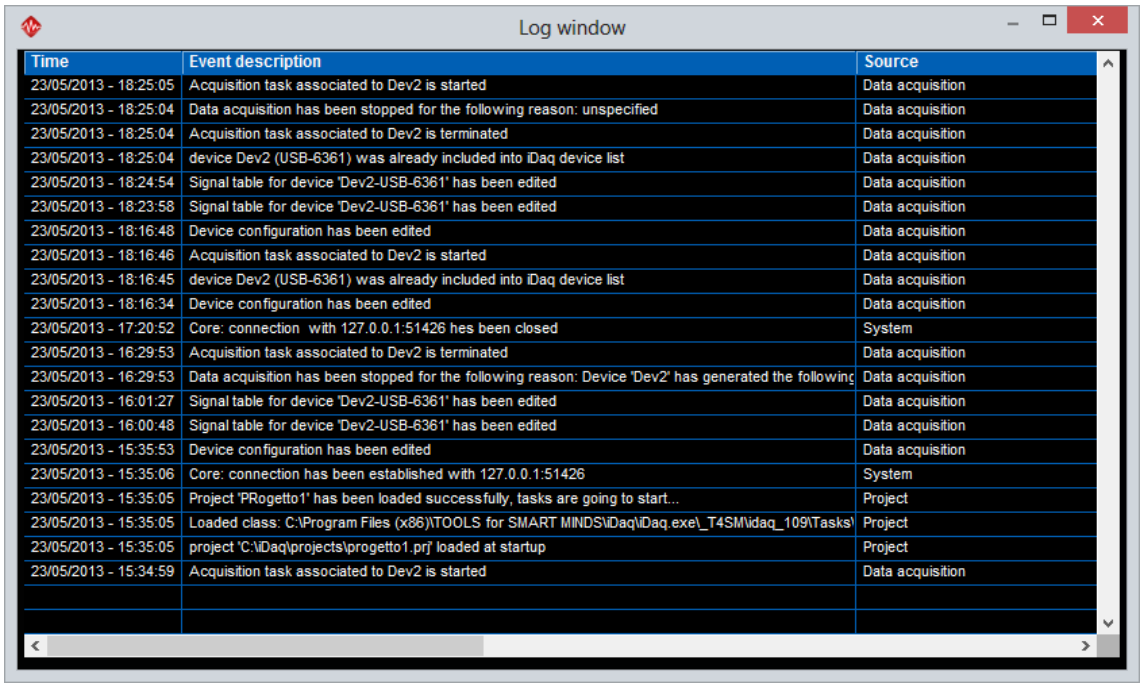
Log window
Time
Event description
Source
23/05/2013 - 18:25:05 Acquisition task associated to Dev2 is started Data acquisition
23/05/2013 - 18:25:04 Data acquisition has been stopped for the following reason: unspecified Data acquisition
23/05/2013 - 18:25:04 Acquisition task associated to Dev2 is terminated Data acquisition
23/05/2013 - 18:25:04 device Dev2 (USB-6361) was already included into iDaq device list Data acquisition
23/05/2013 - 18:24:54 Signal table for device 'Dev2-USB-6361' has been edited Data acquisition
23/05/2013 - 18:23:58 Signal table for device 'Dev2-USB-6361' has been edited Data acquisition
23/05/2013 - 18:16:48 Device configuration has been edited Data acquisition
23/05/2013 - 18:16:46 Acquisition task associated to Dev2 is started Data acquisition
23/05/2013 - 18:16:45 device Dev2 (USB-6361) was already included into iDaq device list Data acquisition
23/05/2013 - 18:16:34 Device configuration has been edited Data acquisition
23/05/2013 - 17:20:52 Core: connection with 127.0.0.1:51426 hes been closed System
23/05/2013 - 16:29:53 Acquisition task associated to Dev2 is terminated Data acquisition
23/05/2013 - 16:29:53 Data acquisition has been stopped for the following reason: Device 'Dev2' has generated the following Data acquisition
23/05/2013 - 16:01:27 Signal table for device 'Dev2-USB-6361' has been edited Data acquisition
23/05/2013 - 16:00:48 Signal table for device 'Dev2-USB-6361' has been edited Data acquisition
23/05/2013 - 15:35:53 Device configuration has been edited Data acquisition
23/05/2013 - 15:35:06 Core: connection has been established with 127.0.0.1:51426 System
23/05/2013 - 15:35:05 Project 'PRogetto1' has been loaded successfully, tasks are going to start... Project
23/05/2013 - 15:35:05 Loaded class: C:\Program Files (x86)\TOOLS for SMART MINDS\iDaq\iDaq.exe_T4SM\idaq_109\Tasks\ Project
23/05/2013 - 15:35:05 project 'C:\iDaq\projects\progetto1.prj' loaded at startup Project
23/05/2013 - 15:34:59 Acquisition task associated to Dev2 is started Data acquisition

FIGURE 25 - LOG WINDOW EXAMPLE.

Click on **Configuration ▸ Close Log window** from iDaq menu or press **F7** or use "Log window" close button in its upper right corner, to close Log window.

GENERAL SETTINGS: OPTIONS

Options window allows you to manage your data in an easy and fast way. A careful choice of general settings can make your task very easy to manage. Select **Configuration** ▸ **Options** or simply press **F8.**

GENERAL PROJECTS SETTINGS

This tab groups settings that affect the way projects are managed by iDaq.

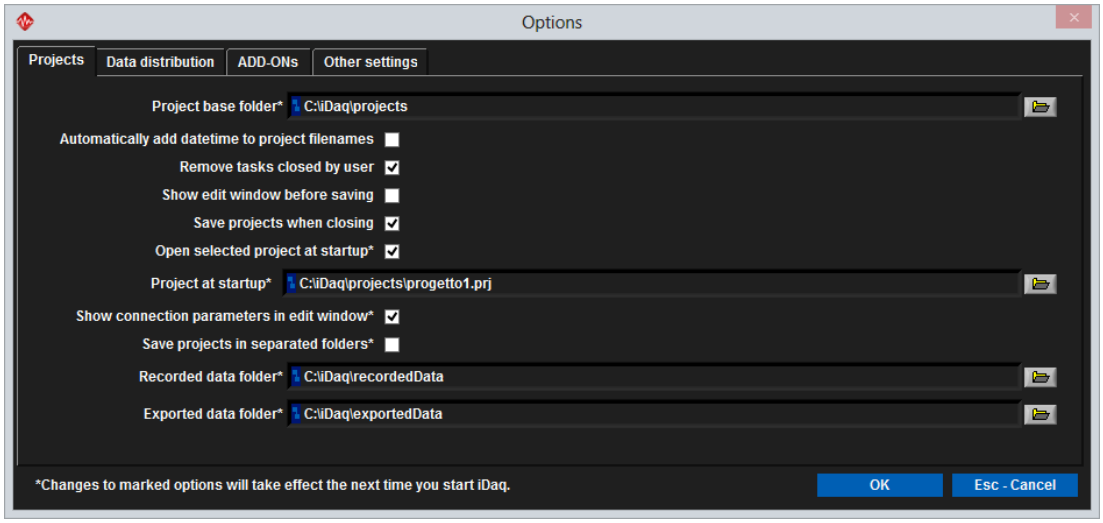

FIGURE 26 - PROJECTS SETTINGS WINDOW

- **Select folder fields:** When you install iDaq on your computer, it creates by default some folders where your data are saved. In this window you can see three special fields, as **Project base folder**, **Recorded data folder** and **Exported data folder,** showing you the default path you have to follow to find your data. If you think it would be handier, you can choose to create a folder every time you begin a project by checking the **Save projects in separated folders field**. If you think, instead, it would be more comfortable for you having data in other folders, you can change the folder paths as you like. Remember to select **OK** button to save your settings and restart or cancel if you don't want save them.
- **Automatically add datetime to project filenames:** Appends the date in which the file has been created to the project name.
- **Remove tasks closed by user:** If you check this option iDaq doesn't save the charts you've closed in your working session: iDaq saves only charts that you keep open in the project.
- **Show edit window before saving:** If you check this option iDaq, every time you are closing a project, opens the Edit Window.
- **Save projects when closing:** If you check this option iDaq saves automatically your projects when you close your projects.
- **Open selected project at startup:** If you check this option, every time iDaq starts, it opens automatically the project you've chosen here. Once you've marked this checkbox **project at startup** is enabled in which you have to select a project.

DATA DISTRIBUTION

In this tag are grouped all of the details regarding data distribution and PC connection with other clients.

iDaq gives you the possibility of sharing and distribute data in the easiest way, only by clicking the **Allow Remote Clients to connect** checkbox. By means of cloud computing sharing, this feature allows several users to work on the same data simultaneously from different workspaces, using your PC as a data dispenser : the following diagram explains data distribution functioning.

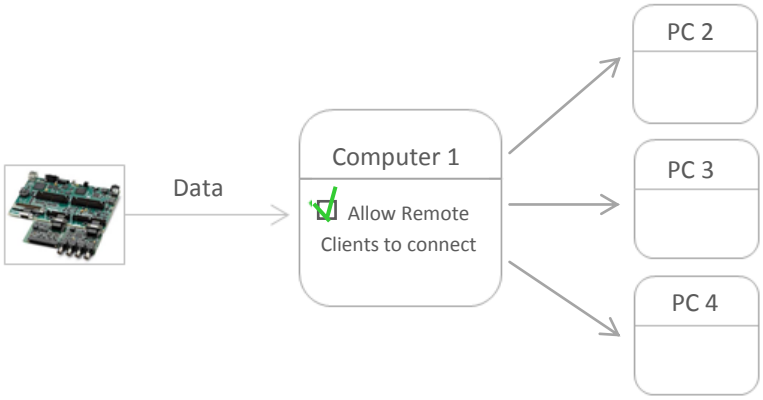

FIGURE 27 DATA DISTRIBUTION FUNCTIONING DIAGRAM

This can particularly be useful in case PC 2, PC 3 or PC 4 are a little underpowered computers not able to support thousands of data coming directly by the NI device. iDaq has solved similar problems: Computer 1 in the diagram receives arriving data and real time distributes them to the other PCs, in order to avoid wasting time and slowing down CPUs and as well taking advantage of simultaneous workspaces where data can be analysed.

The next image represents the Data distribution window:

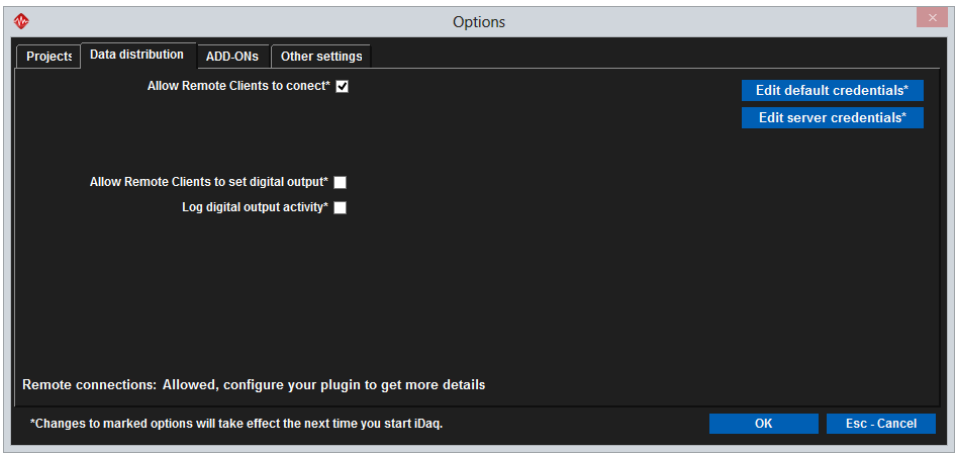
Options
Projects
Data distribution
ADD-ONs
Other settings
Allow Remote Clients to conect*
Edit default credentials*
Edit server credentials*
Allow Remote Clients to set digital output*
Log digital output activity*
Remote connections: Allowed, configure your plugin to get more details
*Changes to marked options will take effect the next time you start iDaq.
OK
Esc - Cancel

FIGURE 28 DATA DISTRIBUTION OPTION WINDOW

At the right side of the window, you have been provided with two Connection credentials editors: **Edit default credential button** and **Edit server credential button**. In order to insert all default connection details, clicking on the **Edit default credentials** button: it opens a window with fields in which you have to specify **Server address**, **Server port** and **password**.

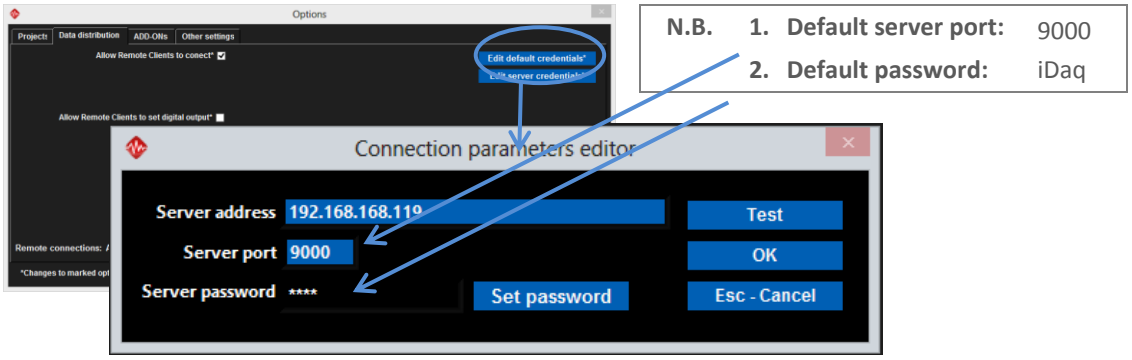

FIGURE 29 CONNECTION PARAMETERS EDITOR

Inserting the default password enables you to choose a new one.

FACTORY SETTINGS

As it has been introduced in the chapter before, there are a few default settings you have to know in order to manage connections at the first time. When iDaq is installed for the first time, in facts, its factory settings are:

Enable remote connections = False

Default client credentials:

- Server address= localhost
- Server port= 9000
- Server password= iDaq

Default server credentials:

- Server address= localhost
- Server port= 9000
- Server password= iDaq

DATA DISTRIBUTION ADVISING SIGNALS

Once you succeeded in opening a remote connection with Server, iDaq advises you by means of graphic signs so that you are always aware of which source you're connected to.

When the data you're receiving come from a *remote source*, iDaq equips your opened *Chart window* with the **Remote source signal**, represented by a white square with an **RS** (Remote Source) written within it. The next image represents the Chart window when iDaq is connected to a remote source:

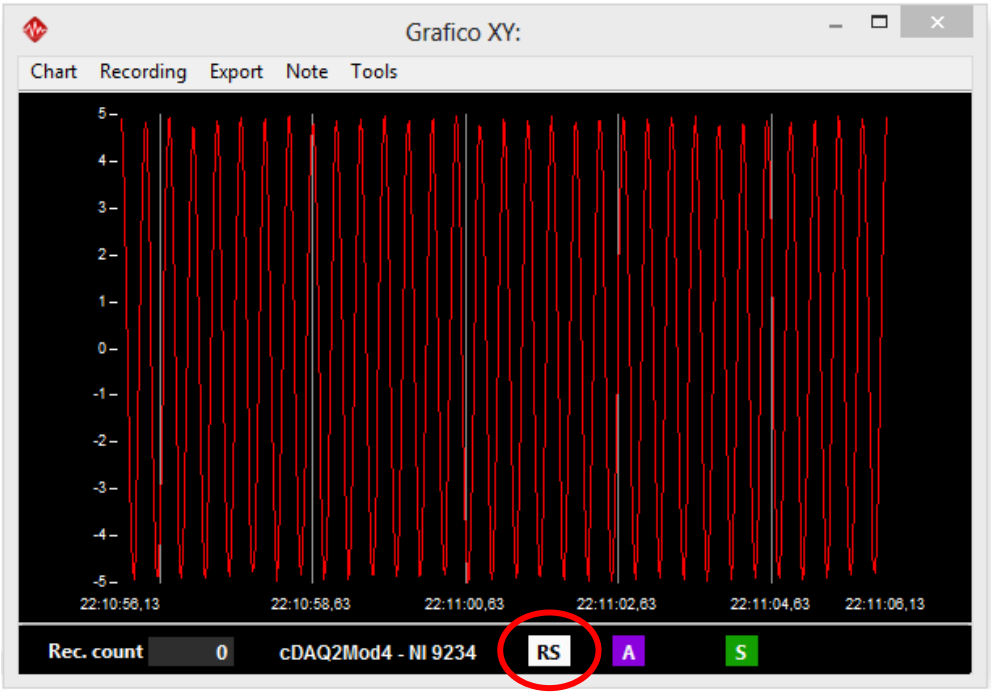

FIGURE 30 REMOTE SOURCE CONNECTED SIGNAL IN CHART WINDOW (CLIENT SIDE)

On the other hand when the server has one or more clients connected for data sharing, on server side appears the **Remote Connection signal**, which is represented by a white square with **RC** (Remote Connection) written within it, appears on the server *iDaq main window* as a remember that a connection has been opened with clients.

The following image shows how the iDaq main window looks when a remote connection has been opened.

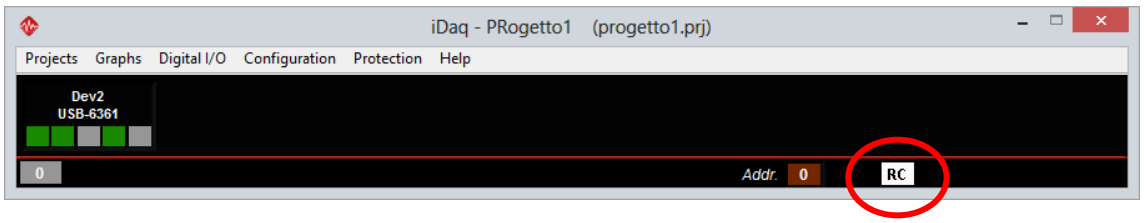

FIGURE 31 REMOTE CONNECTION ONGOING SIGNAL IN MAIN WINDOW (SERVER SIDE)

ADD-ONs

iDaq enables you also to install useful ADD-ONs, third party additional components that provide functional utilities to support the default iDaq tools. The possibility of introducing new tools and increasing iDaq potentialities in such an easy way makes it a flexible and customizable solution.

iDaq has been developed in order to enable users to manage it autonomously and to supplement it in the way they need: with this purpose it allows to install any LabVIEW–developed plug-in. Installing it is very easy: you only have to put your ADD-ONs in the folder indicated in the **ADD-ON folder field**.

You can change it by modifying and typing the folder path you prefer in, then click on the OK button (the changes you've done will be effective only after the next iDaq restart).

After having placed your ADD-ONs, click on the **Install** button: it opens the ADD-ON folder you've selected and makes you choose the files you want to add to iDaq.

At the end of this process, you see the ADD-ONs appearing in the **Installed ADD-ONs table**, as the following image shows:

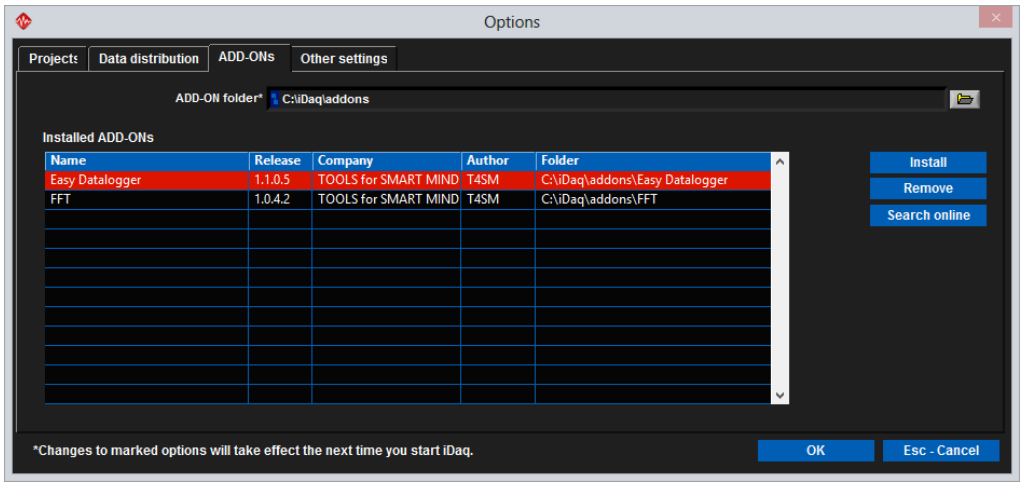

FIGURE 32 INSTALLING ADD-ONS

Once installed, you can open the ADD-ON simply by clicking in the iDaq main window menu on **Graphs ▸ Name of the installed ADD-ON.**

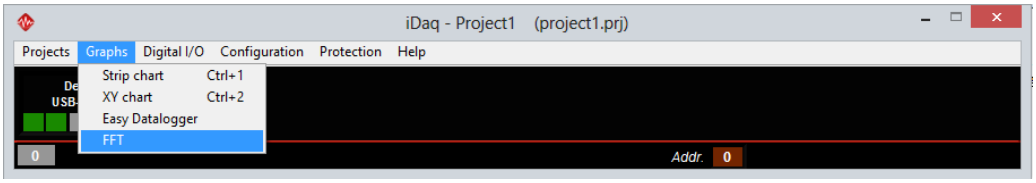

FIGURE 33 OPENING INSTALLED ADD-ONS

MONITORING DIGITAL I/O

In this chapter are explained the instruments iDaq gives you to monitor Digital Input and Output lines in a few clicks.

DIGITAL INPUTS MONITOR WINDOW

iDaq provides you with a useful Digital input lines monitoring window: click **Digital I/O ▸ Digital input** in the main window menu in order to open it.

In the just opened window you can see a table listing all the digital input lines that iDaq gets by the connected device. The window title provides you with the device name the table is referred to.

This table provides you with three columns:

- **Logical name column:** it gives you the name of the Digital input lines.
- **Physical name column:** it gives you the Digital input line name as indicated on the NI acquiring device.
- **Value column:** it gives you information (On or Off) about the digital line status.

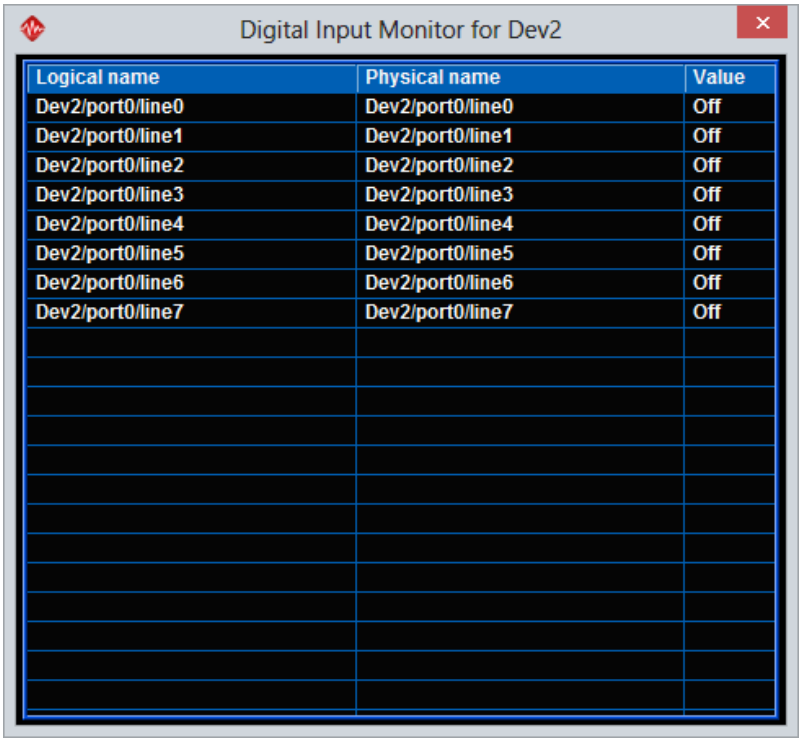

FIGURE 34 DIGITAL INPUT MONITOR

DIGITAL OUTPUTS MONITOR WINDOW

Together with Digital inputs editor, iDaq gives you a Digital Output lines monitoring window: click **Digital I/O ▸ Digital output** in the main window menu to open it.

The table you find out is a list of all the digital output lines that iDaq gets by the connected device: according to that the window title provides you with the device name the table is referred to.

This table provides you with three columns:

- **Logical name column:** it gives you the name of the Digital output lines.
- **Physical name column:** it gives you the Digital output line name as indicated on the NI acquiring device.
- **Value column:** it gives you information (On or Off) about the digital line status. You can easily change the Digital Output line value by double-clicking on it.

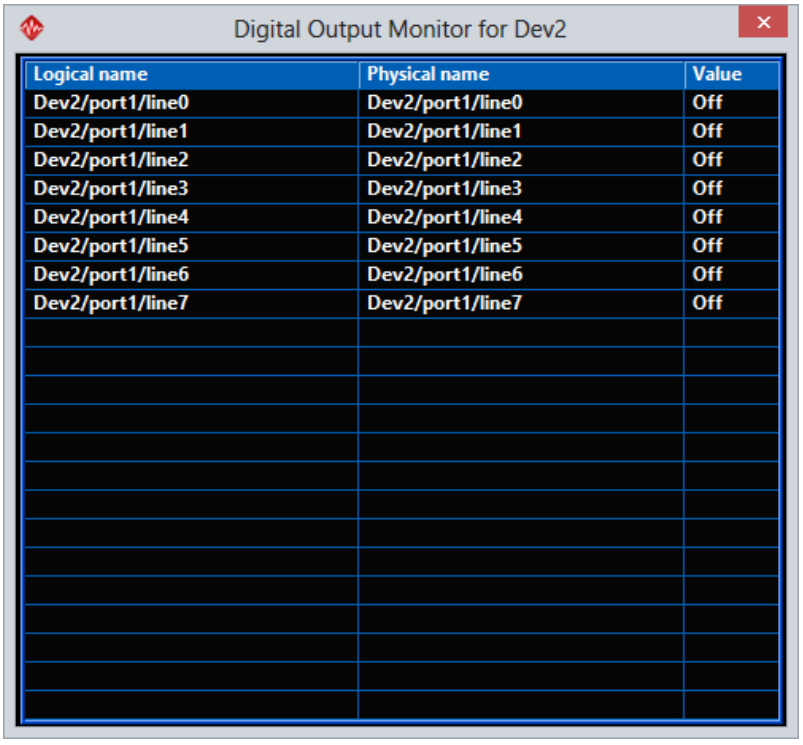

FIGURE 35 DIGITAL OUTPUT MONITOR

If you have more than a device having Digital Output lines, iDaq gives you the possibility of choosing which Device you want to monitor.

CHARTS

INTRODUCTION

This chapter explains how to create a chart and how to set it in order to make it work in the best way, depending on your needs. Charts are important instruments that allow to display the progress of received signals in real-time: in this chapter you can learn to analyze charts, record and use them successfully. There are two types of charts you can create:

STRIP CHART

The strip chart is the most used type of acquisition: it allows to display acquired values of input signals in the time domain.

GETTING STARTED WITH A STRIP CHART

In order to create a Strip chart, click on **Graphs** ▸ **Strip Chart** from the drop down menu of the iDaq main window. The following image represent the "New chart" window.

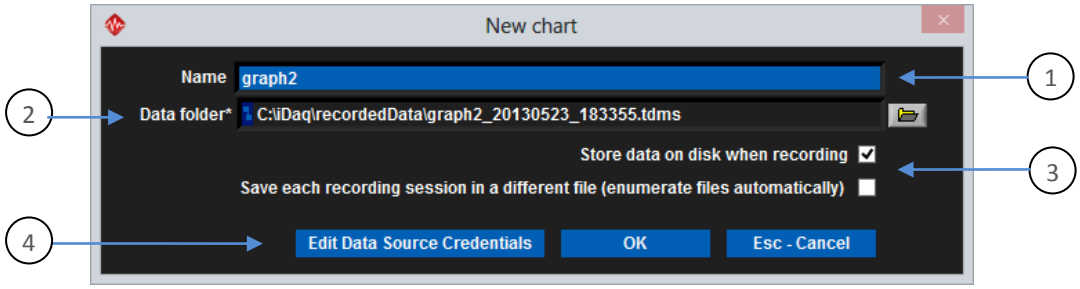

FIGURE 36 - CREATING A NEW STRIP CHART

1. Insert a *Name* for the new chart: this is a part of the name of the file in which acquired data are saved.
2. Under the *Chart Name* field you can see the *File Path* appearing as you are typing the Chart Name in. Its function is to make you know where you can find the Chart file you're creating. iDaq automatically gives you a default file path, but you can change it if you want.
3. *Optional check boxes:* Be careful about them.
   If you uncheck the first one all your data in this work session WON'T be saved. This means that even though you start a recording session, the recorded data won't be saved. It allows you to see only the number of recording sessions of the project, but doesn't keep data saved on your computer.
   If you check the second one, all your recording session will be saved in a different file, instead of a unique file.
4. *Edit Data Source Credentials*: Clicking it enables you to set the parameters of a connection to a remote source, i.e. an engine directly connected to your acquiring board. In order to establish the connection you just have to type in the IP address and server port.
5. Finally press the **OK** button and start your working session.

After having clicked on **OK button**, two windows are opened: the "Data view window" and the "Configuring Acquisition Channels window".

CONFIGURING ACQUISITION CHANNELS

Here you can configure acquisition channels.

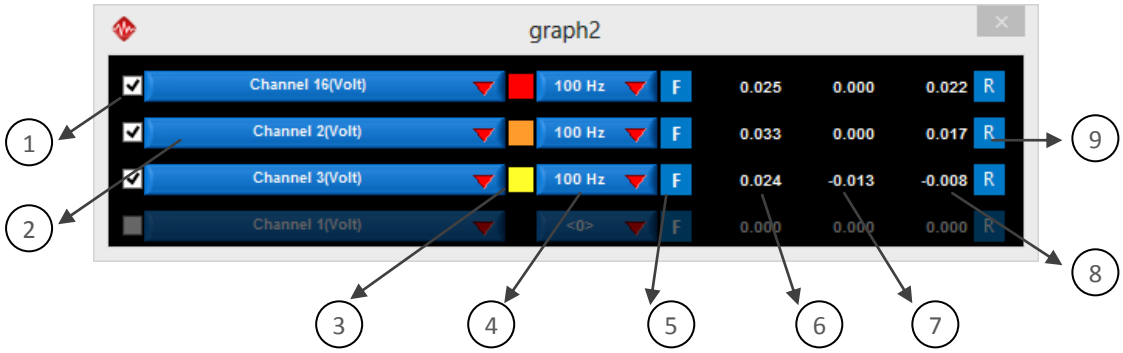

FIGURE 37 "CONFIGURING ACQUISITION CHANNELS" WINDOW

The "Configuring acquisition channels" window has the following elements:

1. **Analog Channel check box:** If you check it, the selected channel is added to those that are displayed in the chart.
2. **Selection list:** You choose the channel you want to analyze from this list. Only data from selected channels can be saved in the file related to the chart.
3. **Chart color:** You can modify the color of every channel by clicking on the *Color selection box*.
4. **Frequency of Data acquisition List:** The signals of every channel can be acquired with different frequencies. iDaq establishes a maximum frequency of acquisition from the device according to the number of acquired channels. For example: if the maximum frequency given for a device with 8 channels is 6 KHz, in the "Frequency of Data acquisition List" there are the values 0,1 Hz, 1 Hz, 10 Hz, 100 Hz 1 KHz, 6 KHz.
5. **Signal filtering:** You can give to every channel a filter before displaying data. For more information about it, look at the "*Signal filtering"* chapter.
6. **Minimum value:** is the minimum value among the channels values, expressed as measurement unit related to that channel. The minimum value is updated 10 times per second.
7. **Maximum value:** is the maximum value among the channels values, expressed as measurement unit related to that channel. The maximum value is updated 10 times per second.
8. **Actual value:** is the value actually arriving from the data source.
9. **Reset button:** The reset button allows you to reset the minimum/maximum values to zero. After every reset iDaq calculates again the minimum/maximum values according to new acquired data.

SIGNAL FILTERING

You can activate a filter for every channel you want. I can set the filters by clicking on the **F** button in the "Configuring acquisition channels" window as shown below:

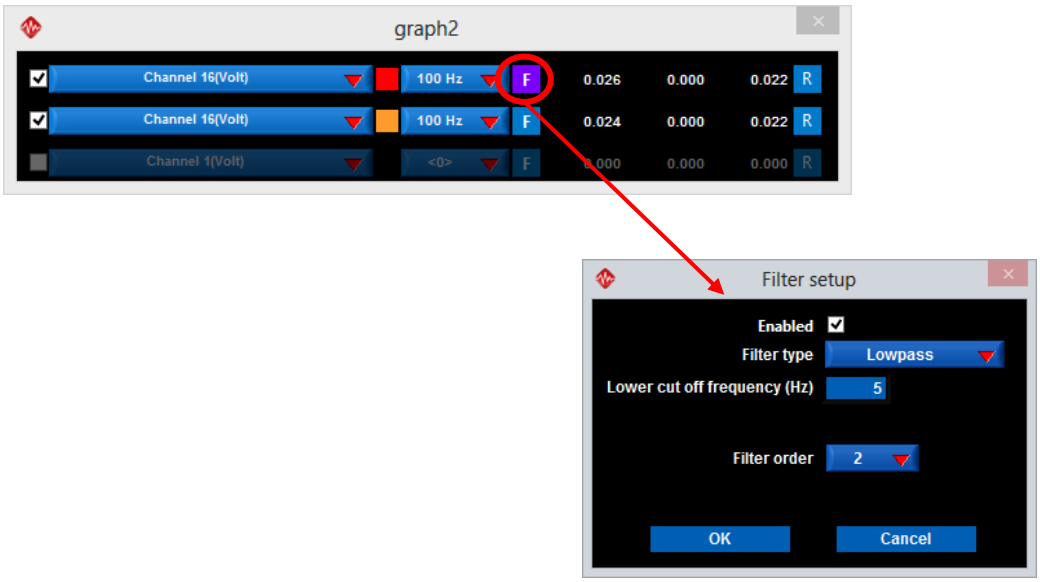

FIGURE 38 - SETTING SIGNAL FILTERS

After having been enabled the filter option, you can see there are four types of filters:

- **Lowpass filter:** This filter passes all the signals with a lower frequency than the indicated *Lower cut off frequency*. For example: if you set the Lower cut-off frequency on 5 Hz, the filter passes only signals with frequency < 5 Hz.
- **Highpass filter:** This filter passes all the signals with a higher frequency than the indicated *Higher cut-off frequency.* For example: if you set the Higher cut-off frequency on 40 Hz, the filter passes only signals with frequency > 40 Hz.
- **Bandpass filter:** This filter passes signals with a frequency within a certain range and rejects frequencies outside that range. For example: if you set the Lower cut-off frequency on 5 Hz and the Higher cut-off frequency on 40 Hz, the filter passes signals with 5 Hz < Frequency < 40 Hz.
- **Bandstop filter:** This filter passes signals with a frequency outside a certain range. For example: if you set the Lower cut-off frequency on 5 Hz and the Higher cut-off frequency on 40 Hz, the filter rejects signals with 5 Hz < Frequency < 40 Hz.

DATA VIEW

In the Data view window you can see the progressive going on of acquired signals.

iDaq allows you to handle the chart in different ways with different tools:

- **Autoscale:** Click on **Chart** ▸ **Autoscale** or press **Ctrl+A**. The *Autoscale* scales automatically the signal while it is going on, so that you can see it to the maximum zoom possible but always seeing it in all his parts. If the Autoscale is selected, a **violet square** with an A (Autoscale) within it appears down in the Data view window.
- **Hold:** Click on **Chart** ▸ **Hold** or press **Ctrl+F**. The *Hold* tool allows you to stop the signals acquisition in order to analyse them. If the Hold tool is selected, a **light blue square** with an H (Hold) within it appears down in the Data view window.
- **Clear:** Click on **Chart** ▸ **Clear** to clear the chart from the signals displayed before.
- **Set Zero Offset:** Click on **Chart** > **Set Zero Offset** or press **Ctrl+Z**. Set Zero Offset allows to subtract the signal value (the last one recorded before this function was activated) from the signal itself. It can be very useful, for example, to compensate offset errors occurring in acquiring signals from sensors. If Set Zero Offset is enabled, a **yellow square** with ZO (Zero Offset) written within it appears down in the Data view window.
- **Unset Zero Offset:** Click on **Chart** > **Unset Zero Offset** or press **Ctrl+Shift+Z**. Unset Zero Offset disables the Set Zero Offset function.

  The following image graphically shows what happens when you turn on or off the Zero Offset function:

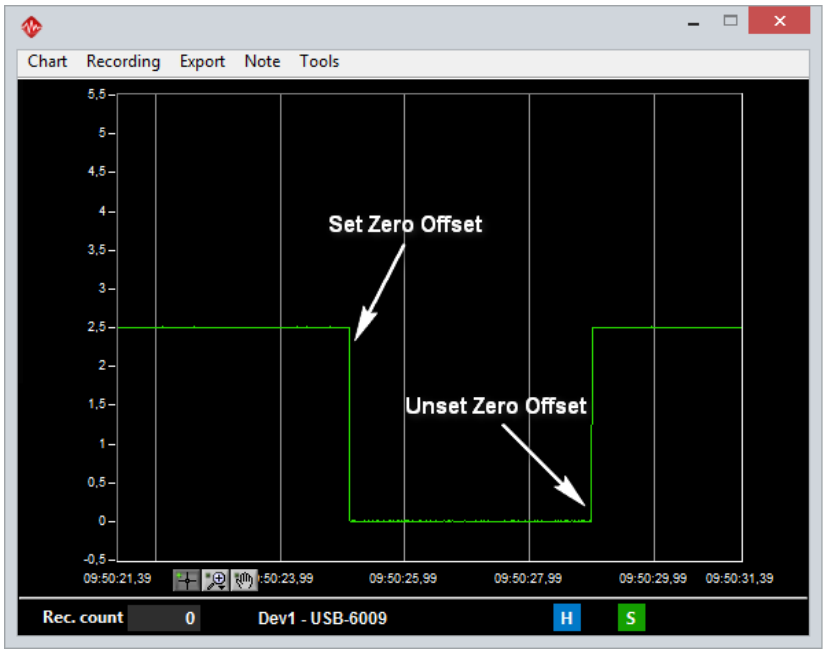

FIGURE 39 SETTING AND UNSETTING ZERO OFFSET FUNCTION

XY CHARTS

In this paragraph you will learn how to use XY charts. This type of chart allows to compare how a signal Y changes according to variations of a signal X. Signal X is the agent that produces changes into the system you are monitoring and signal Y reflects these changes in its values. For example, you can display into an X-Y chart how a torque changes into a breaking system when oil pressure is modified. in this case oil pressure is the agent that causes measured torque to increase or decrease.

GETTING STARTED WITH XY CHARTS

In order to create a XY chart you have to select **Charts ▸ XY charts** from the drop down menu of the iDaq main window. The following figure illustrates the "New chart" window:

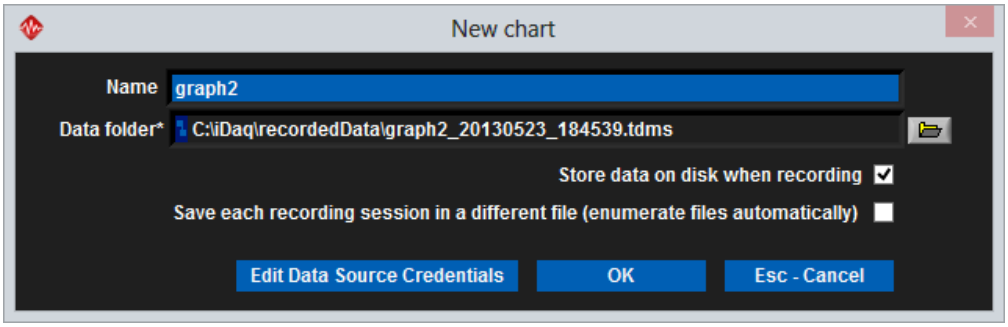

FIGURE 40 - CREATING A NEW XY CHART

You can look at the "Getting started with Strip charts" section of this manual if you want know more about this window and its functions. After having clicked on **OK** button, two windows are opened: the "Data view window" and the "Configuring Acquisition Channels window".

CONFIGURING ACQUISITION CHANNELS

Here you can configure your acquisition channels:

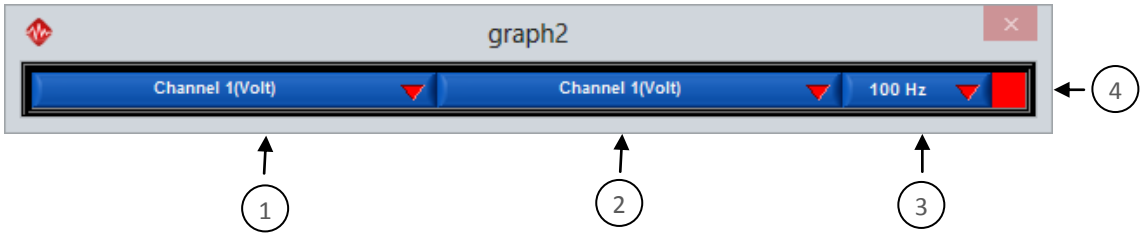

FIGURE 41 - "CONFIGURING ACQUISITION CHANNELS" WINDOW

The "Configuring acquisition channels" window has the following functionalities:

1. **Select Channel X**: Here you can select the first channel you want view in the Data Chart. Acquired data from this channel are displayed in the X axis.
2. **Select Channel Y**: Here you can select the second channel you want view in the Data Chart. Acquired data from this channel are displayed in the Y axis.
3. **Select Frequency**: Here you can select the frequency you want to receive signals.
4. **Select Color:** Here you can select a color for the line of the chart.

DATA VIEW

In the "Data view window" you can see a XY chart which represents the signal values of your channels related to the X and Y axis. The chart line is made by points in which, for example, an X point is given by a channel a 2 signal value and an Y point is given by a channel a 1 signal value.

The following figure illustrates a simple XY chart:

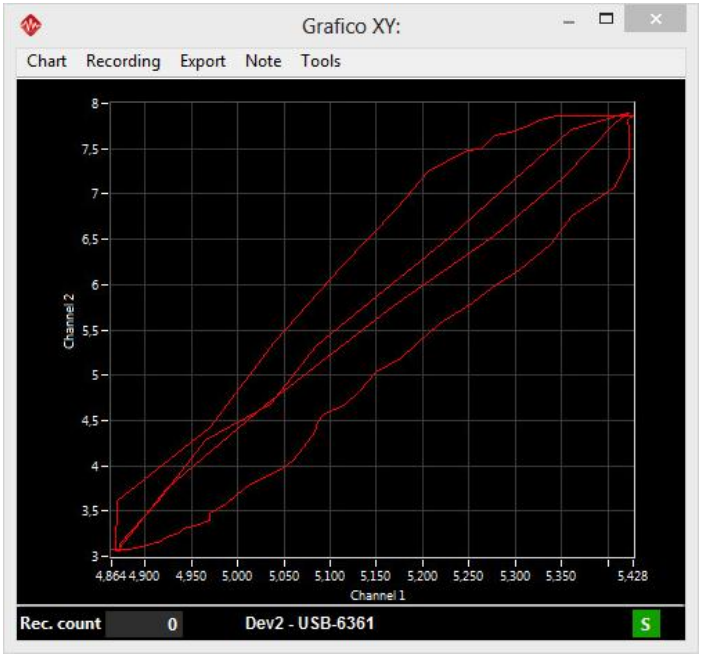

FIGURE 42 - EXAMPLE OF XY CHART

In the data view window you have:

- **Autoscale:** Click on **Chart ▸ Autoscale** or press **Ctrl+A**. The *Autoscale* scales automatically the signal while it is going on, so that you can see it to the maximum zoom possible but always seeing it in all his parts. If the Autoscale is selected, a **violet square** with an A (Autoscale) within it appears down in the Data view window.
- **Hold:** Click on **Chart ▸ Hold** or press **Ctrl+F**. The *Hold* tool allows you to stop the signals acquisition in order to analyse them. If the Hold tool is selected, a **light blue square** with an H (Hold) within it appears down in the Data view window.
- **Clear:** Click on **Chart ▸ Clear** to clear the chart from the signals displayed before.

RECORDING

The Recording function allows you to save signals streams on file. If you want to start a *recording session* click **Recording ▸ Start** or press **Ctrl+D**. If you want stop the recording session click **Recording ▸ Stop**

1. During a recording session iDaq indicates in the title bar the *name of the file* where data are saved.
2. An **orange square** with a white R (Recording) within it suggests you that the recording session is still in progress. Be careful about the **green square** with a white S (Storing) within it on the right: if instead of it there is a **red square** with a crossed S within it, your data won't be saved even though you start a recording session. The absence of the S (Saving) square can be caused by the missed selection of the "Save data" check box (look at the chapter "*Getting started with Strip Charts*"). If you want to set this Save option, select **Recording ▸ File settings** and check the "*Store data on disk when recording*" option.
3. The *recording counter* counts one finished record every time you stop a started session.
4. You can set your recording sessions through triggers.

TRIGGERS

Triggers are user defined rules that iDaq uses to start and stop recording sessions programmatically. Triggers can be defined as conditions on acquired signals or timestamps (for example a trigger could switch on when a signal moves out a specific range of values and another trigger could switch when a selected time is reached). Every chart has its own set of triggers and triggers of a chart can't affect the behaviour of another one.

Click **Recording ▸ Config Triggers** or press **Ctrl+T** to open the *Trigger editor window*, where you can easily handle your triggers. The next image represents the Trigger editor window's interface:

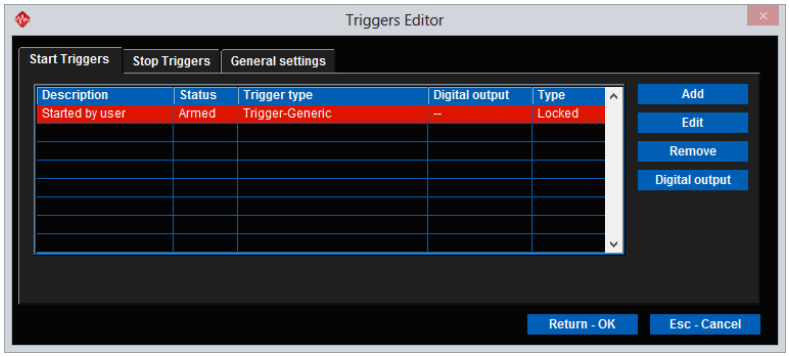

FIGURE 43 TRIGGERS EDITOR WINDOW

In order to provide you with the clearest explanation about triggers, this chapter has been divided into *two chapters about general working* and essential information about *triggers evaluation*, *one chapter*

showing the two main groups triggers are contained into and finally into a chapter with a *deep practical analysis of all trigger types* and functionalities.

How triggers work

Triggers are managed as a set of rules that iDaq evaluates at run-time for every acquired sample. The evaluation process is done into the iDaq pipeline after that data have been filtered and sub-sampled, so that events taking place into high frequency unprocessed data streams can't actually be detected if filters and sub-sampling are active. Triggers are evaluated on all of the acquisition channels, regardless of whether they are displayed or not; i.e. a trigger event can be switched by a signal even though it hasn't been displayed. The following scheme illustrates how iDaq evaluates triggers:

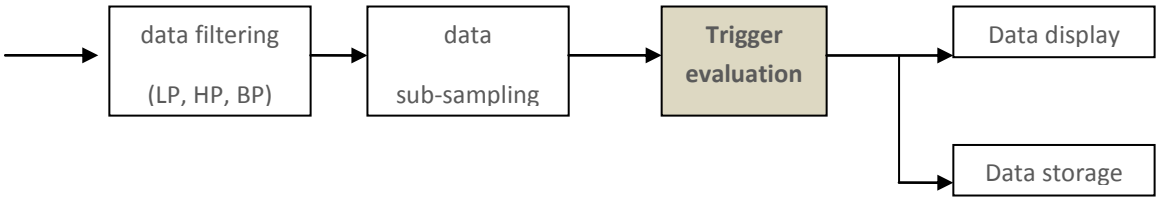

Figure 44 Trigger evaluation inside iDaq data processing pipeline

In relation to the matter of triggers evaluation, the next chapter examines in depth the settings you are provided with in order to enable or disable the evaluation of certain triggers.

Armed triggers

IDaq evaluates at run-time only **armed** triggers: note that, in facts, by default every new trigger is automatically armed. When an armed trigger switches, iDaq can either re-arm it or leave it disarmed according to the trigger setup, so that you can create efficient triggers to use over and over or only one specific time. Even when an existing chart is loaded from disk, its triggers can be automatically armed at start-up forcing iDaq to evaluate them from the very first acquired sample or, similarly, they can be disarmed at start-up to allow you to check your settings system before every recording session. Check the *"Setting triggers" chapter* of this manual for more information.

In order to guarantee the best manageability triggers can be named, so that when a trigger switches iDaq can log this event into a *log file* and you can analyse which triggers have caused your recording session to start and stop.

If multiple triggers are defined to start/stop a recording session, iDaq can evaluate them in two different ways:

- **Evaluate all triggers:** iDaq evaluates all triggers regardless of whether one of them have already started or stopped a recording session.
- **Evaluate until a switch occurs:** iDaq stops triggers evaluation when one of them switches on.

The last way consumes less CPU and it is suggested if your computer has a low computational power.

TRIGGER GROUPS

Regardless of the trigger type, triggers are divided into two groups according to their purpose.

- **Start triggers**: Start triggers start a recording session. Selecting **Recording ▸ Triggers ▸ Config start triggers** gives you a list of all the start triggers you have created in this project. It allows you to organise all of them so that none hind the other; in facts if a trigger B tries to start while another trigger A is still going on, the recording session B can't start until A stops. There are several types of Start triggers being based on different reference values.
  Note that by default iDaq provides the Start triggers list with a basic trigger named "*Trigger start by user*" which can be activated by clicking **Recording ▸ Start** or simply pressing **Ctrl+D**. This kind of trigger is **always** armed and you can neither delete it from the list nor edit it.

- **Stop triggers:** Stop triggers stop a recording session. If you don't set a stop trigger, the started recording session won't stop unless you don't stop it clicking on the Recording menu *Stop option*. Selecting **Recording ▸ Triggers ▸ Config stop triggers** gives you all the stop triggers you have created during this project. There are several types of triggers you can use in order to stop a recording session.
  Note that by default iDaq provides the Stop triggers list with a basic trigger named "*Trigger stop by user*" which can be activated by clicking **Recording ▸ Stop** or simply pressing **Ctrl+O**. This kind of trigger is **always armed** and you can neither delete it from the list nor edit it.

The following image represents the interface of both the Start and Stop Triggers edit window, since for user ease's sake iDaq uses a similar layout for both.

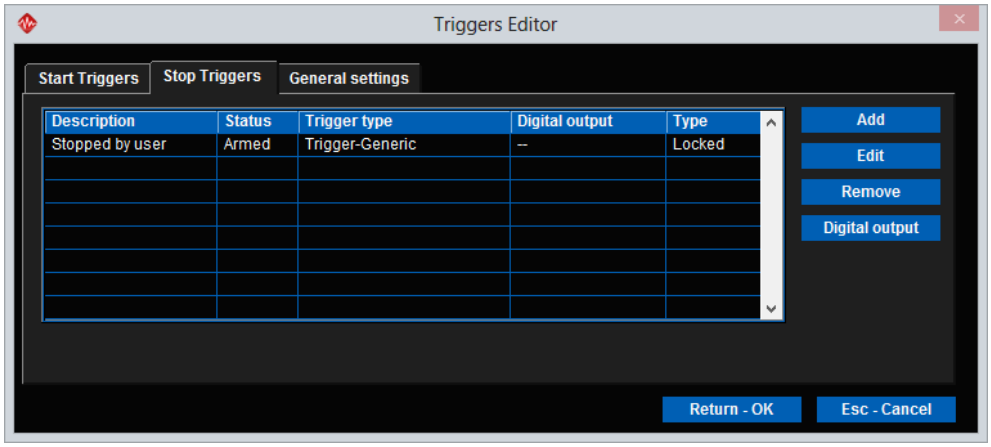

FIGURE 45 STOP TRIGGER EDIT WINDOW

TRIGGER TYPES

iDaq supports the following trigger types:

CROSSING A SELECTED ANALOG VALUE

This trigger lets the recording session start when the signal of a channel crosses a selected analog value. The following figure illustrates the trigger editor with its parameters.

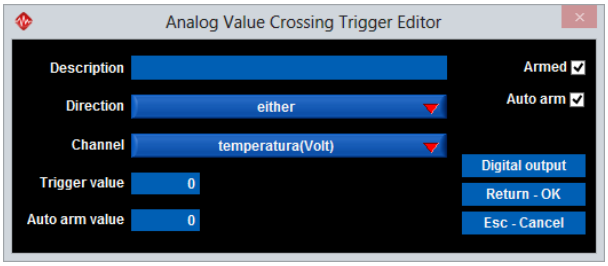

FIGURE 46 "CROSSING ANALOG VALUE" START TRIGGER SETTING WINDOW

- **Description:** indicates the trigger name.
- **Direction:** defines the behaviour of the trigger:
  - **Minus-plus** the trigger switches when the signal crosses the trigger value, coming from a *value lower than Trigger value*
  - **Plus-minus** the trigger switches when the signal crosses the trigger value, coming from *value greater than Trigger value*
  - **Either** the trigger switches when the signal crosses the trigger value regardless of the direction of the signal.
- **Channel:** selects the Analog input channel, used to evaluate the trigger.
- **Trigger Value: d**efines the Analog value that makes the trigger start.
- **Auto arm value:** If the trigger has been stopped, you can define an Auto arm value that re-enables the Trigger.
- **Armed checkbox:** It is possible to arm/disarm the trigger according to whether you check/uncheck this checkbox. By default, this field is checked and therefore the trigger is armed automatically.
- **Auto-arm checkbox:** It is possible to enable/disable the auto-arm functionality according to whether you check/uncheck this checkbox. By default, this field is checked and therefore the trigger is always re-armed automatically.

The following figure illustrates the way iDaq evaluates this trigger according to **direction** value:

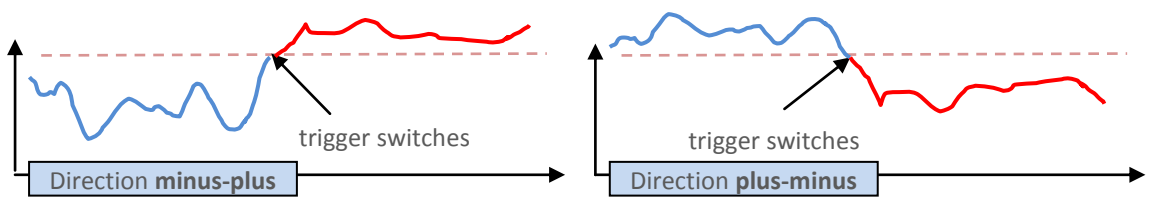

FIGURE 47 - "CROSSING A SELECTED ANALOG VALUE" TRIGGER

This trigger switches when the signal moves inside / outside of a certain range. Range is defined by two values expressed in selected channel's unit of measure. The following figure illustrates the behaviour of this trigger according to two different switch rules:

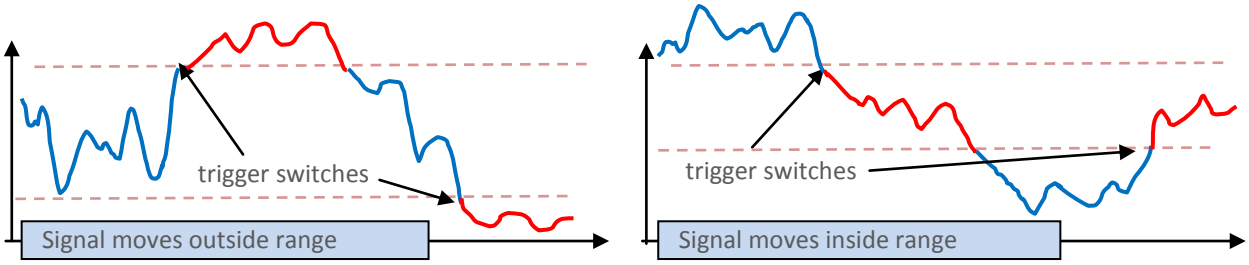

FIGURE 48 - "ANALOG VALUE IN/OUT OF RANGE" TRIGGER

Signal range is defined by lower and upper bound. The following figure illustrates the trigger editor window:

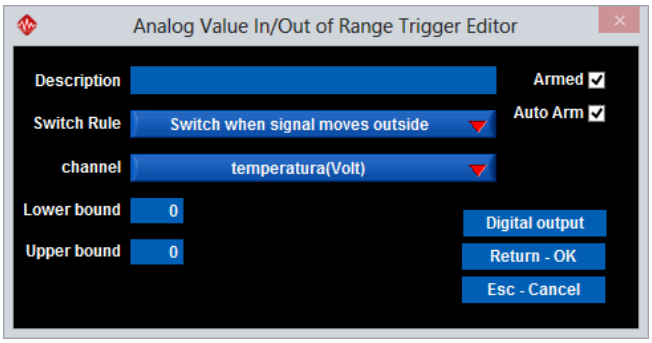

FIGURE 49 "ANALOG VALUE IN/OUT RANGE" START TRIGGER SETTING WINDOW

This trigger is described by the following fields:

- **Description:** indicates the trigger name.
- **Switch rule:** Here you can select if you want that the recording session starts when the signal is inside or outside of a certain range.
- **Channel:** selects the analog input channel, used to evaluate the trigger.
- **Lower bound:** defines the lower bound of the range.
- **Upper bound:** defines the upper bound of the range.
- **Armed checkbox:** It is possible to arm/disarm the trigger according to whether you check/uncheck this checkbox. By default, this field is checked and therefore the trigger is armed automatically.
- **Auto-arm checkbox:** It is possible to enable/disable the auto-arm functionality according to whether you check/uncheck this checkbox. By default, this field is checked and therefore the trigger is always re-armed automatically.

SELECTED TIME(S)

This trigger switches when computer clock reaches selected starting time(s). You can specify a list of times at which the trigger has to switch. Switch times are set with the standard Windows calendar, but only time value is actually considered to decide if the trigger has to switch. Date values are always discarded.

As the following image shows, clicking on the **ADD** button opens the *Switch Time editor*, which enables you to select the time in which you want the recording session start.

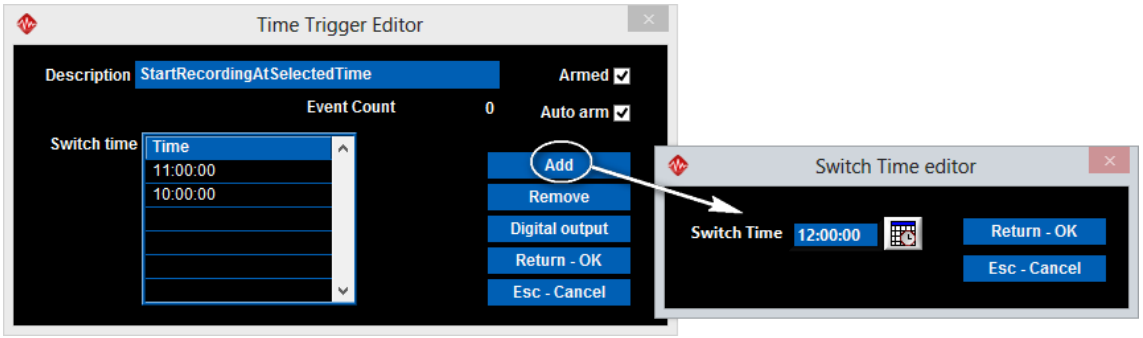

FIGURE 50 "SELECTED TIME" START TRIGGER SETTING WINDOW

This trigger is therefore described by the following fields:

- **Description:** Indicates the trigger name.
- **Switch time:** Provides you with a resuming list of all the "Switched times" set in the *Switch Time editor*. Clicking **ADD** button you can add more Switch time settings, while clicking **Remove** button allows you to delete a selected one if it is no more necessary.
- **Armed checkbox:** It is possible to arm/disarm the trigger according to whether you check/uncheck this checkbox. By default, this field is checked and therefore the trigger is armed automatically.
- **Auto-arm checkbox:** It is possible to enable/disable the auto-arm functionality according to whether you check/uncheck this checkbox. By default, this field is checked and therefore the trigger is always re-armed automatically.

Once you have set your time triggers, click the **Return – OK** button to save your settings or click **Esc – Cancel** button if you want to delete them.

Elapsed time(s)

This trigger lets the recording session start AFTER a definite time being past.

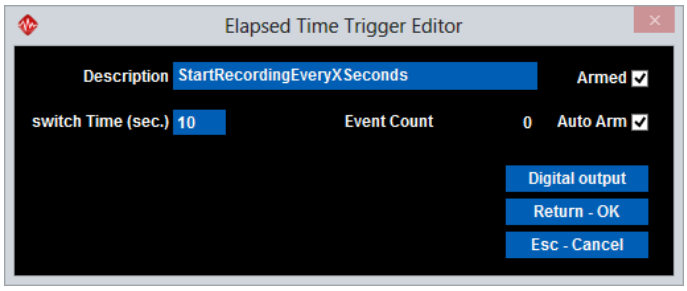

Figure 51 "Elapsed time" start trigger setting window

- **Description:** indicates the trigger name.
- **Switch time (sec.):** Here define how much time you want to pass before the recording session starting. It works like a timer.
- **Auto arm option:** Allows you to reactivate the trigger also after having stopped it.
- **Armed checkbox:** It is possible to arm/disarm the trigger according to whether you check/uncheck it. This field is checked by default and so the trigger is always armed.
- **Auto-arm checkbox:** It is possible to enable/disable the auto-arm functionality according to whether you check/uncheck this checkbox. By default, this field is checked and therefore the trigger is always re-armed automatically.

Digital line change

This trigger switches when selected digital line changes status.

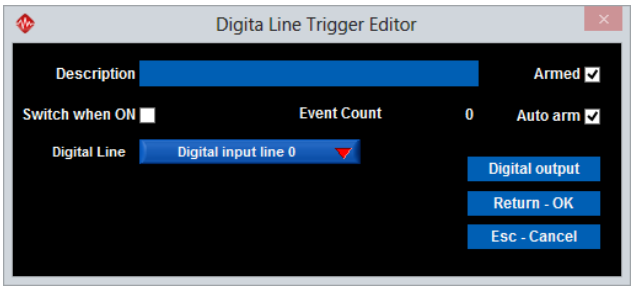

Figure 52 "Digital lines" start trigger setting window

- **Description:** indicates the trigger name.
- **Switch when ON:** If **ON, trigger s**witches the digital line changes from Off to On, otherwise switches when the digital line changes from On to Off.
- **Digital line:** indicates the selected digital line associated to trigger.
- **Armed checkbox:** It is possible to arm/disarm the trigger according to whether you check/uncheck it. This field is checked by default and so the trigger is always armed.

- **Auto-arm checkbox:** It is possible to enable/disable the auto-arm functionality according to whether you check/uncheck this checkbox. By default, this field is checked and therefore the trigger is always re-armed automatically.

Digital outputs

iDaq allows you to link one or more output lines of the board you're using to any trigger event. For example, it is possible to enable a certain output line thanks to a start trigger and in the same way to disable it with a stop trigger. This kind of functionality can be used, for instance, either to start or send a command to an external device.

In order to link one or more digital outputs lines to a trigger event, open the *Triggers editor window* (**Recording ▸ Config Triggers**) and select the **Digital Output button** on the right. Clicking it opens the *Digital Output Settings window*, which contains a list of all the digital outputs associated to that specific trigger event: the following image represents the path to reach it and the interface of this window.

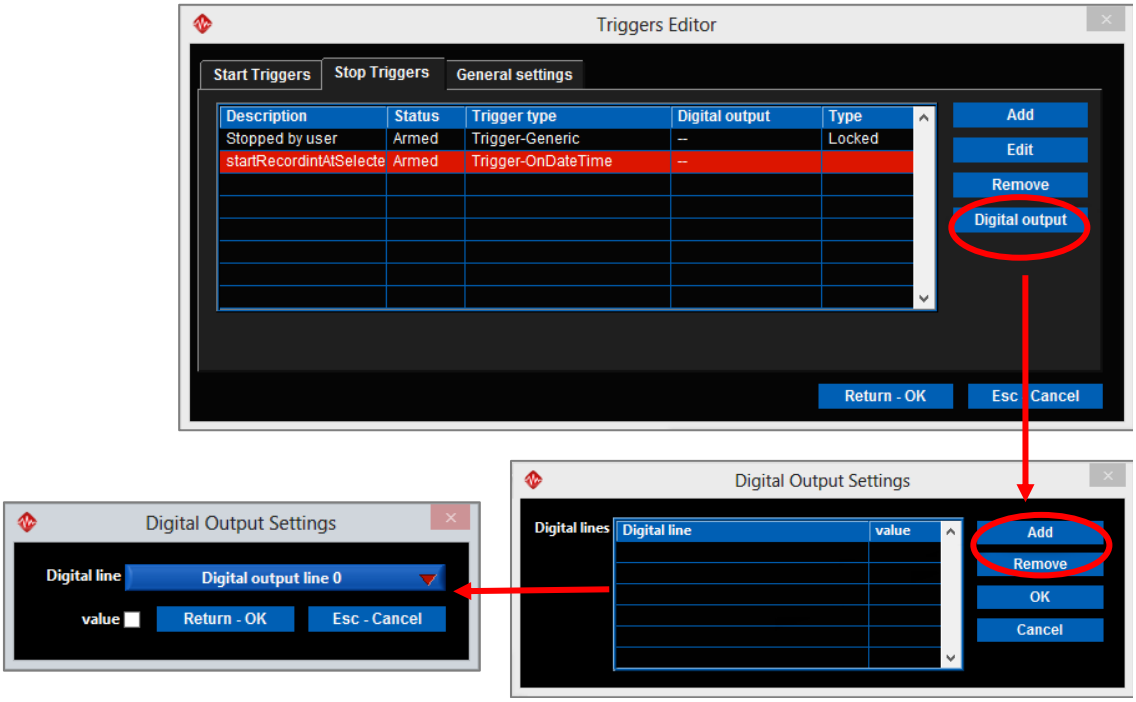

Figure 53 Opening Digital output settings window

As suggested by the image above, you can add new digital outputs by clicking the **ADD** button. The window just opened provides you with the following fields:

- **Digital line:** allows you to select the output line.
- **Value:** After that the trigger has been switched, according to having checked/unchecked this field, it affects the digital outputs in the following ways:
  - **CHECKED:** The output line will have a high logic level (**TRUE**).
  - **UNCHECKED:** The output line will have a low logic level (**FALSE**).

ARM/DISARM TRIGGERS

iDaq allows you both to arm and disarm all of the triggers events even without having to arm/disarm them one by one singularly. In order to arm all of the triggers at the same time, click **Recording ▸ Triggers ▸ Arm Triggers**, while if you want to disarm all of them click on **Recording ▸ Triggers ▸ Disarm Triggers**.

Both these functionalities allow to disarm all the triggers **EXCEPT** the default triggers "*Start/stop by user*".

SETTING TRIGGERS

Triggers defined into a chart can be armed/unarmed. Armed trigger are evaluated when data are acquired, unarmed triggers are not evaluated. All triggers, regardless the fact they are defined to start or stop a recording session, share some general properties you can set from **Recording ▸ Triggers ▸ Settings**.

The figure below shows general triggers settings:

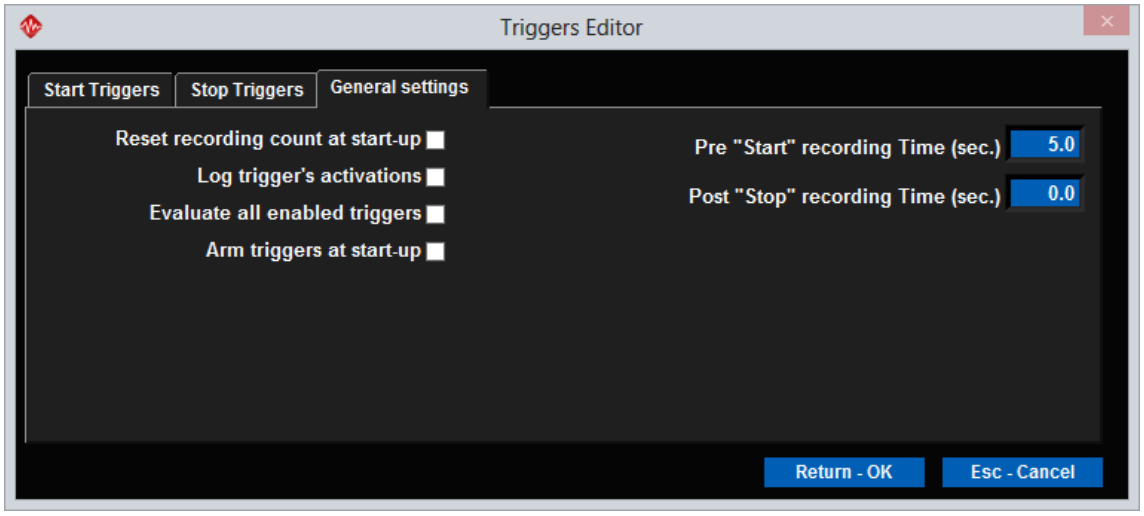

FIGURE 54 "SETTING TRIGGERS" WINDOW

- **Reset recording count at start-up:** Resets the recording count field to zero every time you open the project.
- **Log triggers activation:** When you check the *Log triggers activation* box iDaq creates a file in a folder every time a trigger starts. The Log trigger file is created in the *Recorded Data folder* and shows the date in which the trigger was started and stopped. Be careful: if you start another trigger while the first trigger is still running, the second trigger won't be saved.
- **Evaluate all enabled triggers:** When you check the "*Evaluate all enabled triggers*" checkbox iDaq, if the Log triggers activation checkbox is selected too, considers all enabled triggers and

not the first trigger it finds on the top of the triggers list. Allows you to record all enabled triggers, even if two or more of them start at the same moment.

- **Arm triggers at start-up:** When you check the "*Arm triggers at start-up*" checkbox at the start-up iDaq re-activates the entire Triggers list so that you haven't to enable all triggers by yourself.
- **Pre "Start" recording Time:** Allows you to start the recording session a certain number of seconds before that the trigger start.
- **Post "Stop" recording Time:** Allows you to stop the recording session a certain number of seconds after that the trigger event has started.

EXPORTING DATA

In this chapter you will learn how you can export data you're interested about during a work session.

First of all you have to hold (**Chart ▸ Hold)** the graph, so that iDaq can register which data you want to export.

Now look at the **Export** drop-down menu: you have several services about data export:

- **Export image to file**: If you select it, a copy of the stopped chart is saved in a JPEG format file in the *exportedData folder*.

- **Export image to clipboard**: If you select it, a copy of the stopped chart is stored in the clipboard so that you can past it in a document. This exporting way is less secure than the "export image to file": here you can't save the image until you don't past it.

- **Export data to file:** If you select it, acquired data are saved in a file in the exportedData folder. Before exporting, you can define the data format you want for the data file you're creating. The next figure represents the Data exporting window opened:

    - **General settings functionality**: Here you have to choose a *data format* for the file you're saving. You can select from the drop-down menu either CSV or XML format. In the *Precision* field you can insert the number of decimal digits to record.

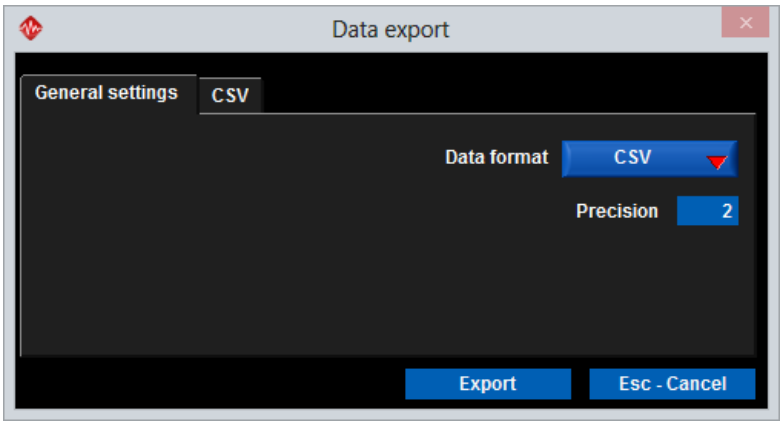

FIGURE 55 DATA EXPORTING OPTIONS

According to the format you choose, you have several options to select. For example, if you press the CSV tab you can see several check-boxes.

The following image represents the CSV tab window and the settings it provides you with.

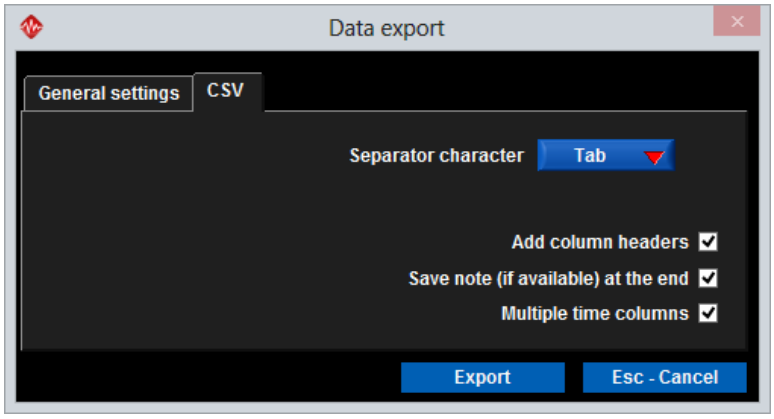

FIGURE 56 SETTING CSV OPTIONS

- **Separator character**: Select the character to separate data in your CSV document.
- **Add column headers**: Assign signals names as titles at the top of columns.
- **Multiple time columns:** Add in the document the date in which data were recorded.

- **Export data to clipboard:** If you select it, a copy of the acquired data is stored in the clipboard so that you can past them in a document.
- **Add legend:** If you select it, a legend is added to the chart, presenting you the number of displayed channels and the colour of each one.
- **Colour boxes:** If you select it, two colour boxes are added to the chart: the first one on the left allows you to select the colour of the chart background, the second one allows you to select the chart foreground. through them you can select the colour of the chart foreground.

PROJECTS

In this chapter you will learn to use iDaq projects. A project is a set of charts including chart's settings, their triggers and other properties.

NEW PROJECT

iDaq always needs an open project for working: for this reason, every time you run iDaq it creates automatically an open project (MyData1) used to maintain your charts into a consistent group.

If you want to create a new project select **Projects ▸ New**.

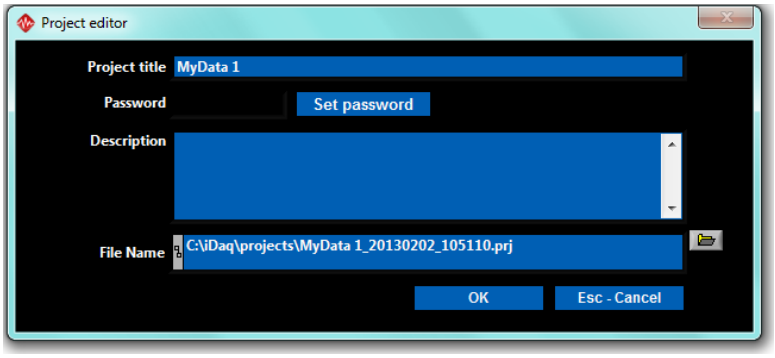

FIGURE 57 CREATING A NEW PROJECT

Here you can define your *Project title* and write a little description of your project purposes. The same window is opened when you select the "*Edit*" option (**Projects ▸ Edit**) if you want to change your project settings.

PROTECTING PROJECTS

When you create a new project or you edit it you can set a password in order to keep it unchanged. iDaq is programmed for automatically saving data when you close it: that's why set a password can be very advantageous: protect your work from improper uses or keep it safe if you want use it but you're worry about modifying it accidentally.

When you set a password to your project, the next time the project will be opened will open a little window asking for the password.

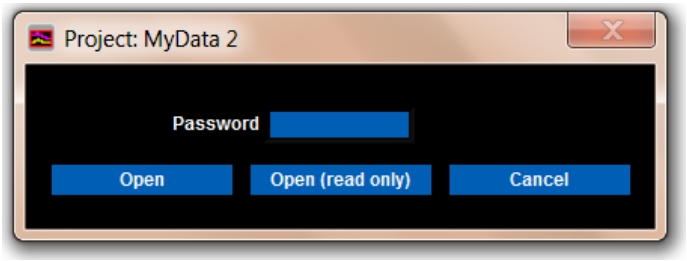

FIGURE 58 SETTING PASSWORD FOR A PROJECT

If you open the project in Read Only mode, you can see all saved data of this project but you can't modify them or add more. All your modification remain only while the RO project is opened: if you close it and try opening it you won't find any change When you open iDaq in Read Only mode a **Red Square with an RO** within it appears in the main window, in order to remember you that all your records or charts in this session won't be saved. If you insert the right password at the project start-up, you completely unlock the project and all your project modifications can be saved.

SAVING CURRENT PROJECTS

Once you have opened a project and you are working on it, you can save your project by clicking on **Projects ▸ Save**. If you want save it in a particular folder, select **Projects ▸ Save as**.

Anyway, as explained before, iDaq saves automatically your work at the end of the working session, each time you close the project.

CLOSING CURRENT PROJECTS

If you want to close a current project, you have to select **Projects ▸ Close**. iDaq closes your work session saving all your work in the Project folder.

PROTECTION

In addition to the possibility of setting a password to open a project, iDaq allows you to protect your work always, even during the working session. iDaq keeps safe your work while you can't stay next to your computer taking care that nothing disturbs the signal acquisition.

LOCKING IDAQ

If you want lock iDaq select **Protection** ▸ **Lock** from the main window. The following image represents the lock window:

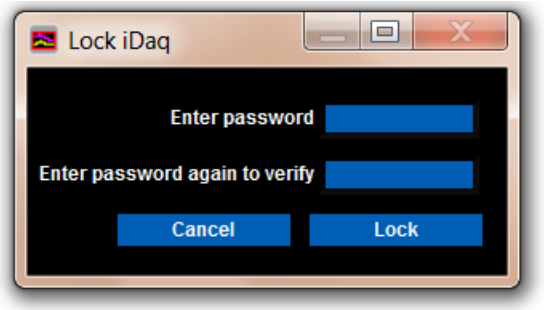

FIGURE 59 "LOCK IDAQ" WINDOW

Enter a password and re-write it to be sure you've written it right and press the **Lock** button. Once you've entered the password a light blue square with an L into may appear in the main window and in the chart window. This means that no one can modify in no way your work until iDaq is locked.

APPENDX A: ADVISING SIGNALS LEGEND

The following indicators are used in different iDaq windows. The following tables summarize signal meanings:

MAIN IDAQ WINDOW

	Green “Acquisition mode: ON” square
	Red “Acquisition mode: OFF” square
	Grey “Acquisition mode: DISABLED” square

SIMPLE CHART WINDOW AND X-Y CHART WINDOW

S	Green “Storing” square
H	Light blue “Hold” square
L	Light blue “Locking” square
ZO	Yellow “Zero Offset” square
R	Orange “Recording” square
$	Red “No storing” square
RO	Red “Read only” square
A	Violet “Autoscale” square
RC	White “Remote connection established” square
RS	White “Remote source connected” square

FIGURE INDEX

FIGURE 1 - INSTALLING IDAQ 12
FIGURE 2 - IDAQ INSTALLATION WIZARD WINDOW 12
FIGURE 3 - IDAQ MAIN WINDOW: ACQUISITION MODE OFF 13
FIGURE 4 - IDAQ MAIN WINDOW: ACQUISITION MODE ON 13
FIGURE 5 - DEVICE SELECTION WINDOW 14
FIGURE 6 ADDING DEVICES TO THE USED DEVICES LIST 14
FIGURE 7 DEVICE SETTINGS WINDOW 15
FIGURE 8 HOW TO OPEN THE CURRENT SIGNAL TABLE 16
FIGURE 9 ANALOG INPUT SIGNALS TAB 16
FIGURE 10 - CALIBRATE ANALOG DATA 17
FIGURE 11 COUNTER INPUT SIGNALS TAB 18
FIGURE 12 SENSOR TYPE SELECTION WINDOW 18
FIGURE 13 CALIBRATE LINEAR POSITION COUNTER WINDOW 20
FIGURE 14 CALIBRATE ANGULAR POSITION COUNTER WINDOW 21
FIGURE 15 CALIBRATE PULSE COUNTER CALIBRATION WINDOW 22
FIGURE 16 CALIBRATE FREQUENCY MEASURE CHANNELS WINDOW 23
FIGURE 17 - ADDING A VIRTUAL SIGNAL 24
FIGURE 18 VIRTUAL CHANNEL CALIBRATION WINDOW 24
FIGURE 19 DIGITAL INPUT LINES TAB IN CURRENT SIGNAL TABLE 27
FIGURE 20 DIGITAL INPUT LINES EDITOR 27
FIGURE 21 DIGITAL OUTPUT LINES TAB IN CURRENT SIGNAL TABLE 28
FIGURE 22 DIGITAL OUTPUT LINES EDITOR 28
FIGURE 23 GENERAL TAB IN CURRENT SIGNAL TABLE 29
FIGURE 24 INITIALIZING SIGNAL TABLE 29
FIGURE 25 - LOG WINDOW EXAMPLE. 30
FIGURE 26 - PROJECTS SETTINGS WINDOW 31

FIGURE 27 DATA DISTRIBUTION FUNCTIONING DIAGRAM....32
FIGURE 28 DATA DISTRIBUTION OPTION WINDOW....32
FIGURE 29 CONNECTION PARAMETERS EDITOR....33
FIGURE 30 REMOTE SOURCE CONNECTED SIGNAL IN CHART WINDOW (CLIENT SIDE)....34
FIGURE 31 REMOTE CONNECTION ONGOING SIGNAL IN MAIN WINDOW (SERVER SIDE)....34
FIGURE 32 INSTALLING ADD-ONS....35
FIGURE 33 OPENING INSTALLED ADD-ONS....35
FIGURE 34 DIGITAL INPUT MONITOR....36
FIGURE 35 DIGITAL OUTPUT MONITOR....37
FIGURE 36 - CREATING A NEW STRIP CHART....38
FIGURE 37 “CONFIGURING ACQUISITION CHANNELS” WINDOW....39
FIGURE 38 - SETTING SIGNAL FILTERS....40
FIGURE 39 SETTING AND UNSETTING ZERO OFFSET FUNCTION....41
FIGURE 40 - CREATING A NEW XY CHART....42
FIGURE 41 - "CONFIGURING ACQUISITION CHANNELS" WINDOW....42
FIGURE 42 - EXAMPLE OF XY CHART....43
FIGURE 43 TRIGGERS EDITOR WINDOW....44
FIGURE 44 TRIGGER EVALUATION INSIDE IDAQ DATA PROCESSING PIPELINE....45
FIGURE 45 STOP TRIGGER EDIT WINDOW....46
FIGURE 46 “CROSSING ANALOG VALUE” START TRIGGER SETTING WINDOW....47
FIGURE 47 - "CROSSING A SELECTED ANALOG VALUE" TRIGGER....47
FIGURE 48 - "ANALOG VALUE IN/OUT OF RANGE" TRIGGER....48
FIGURE 49 “ANALOG VALUE IN/OUT RANGE” START TRIGGER SETTING WINDOW....48
FIGURE 50 “SELECTED TIME” START TRIGGER SETTING WINDOW....49
FIGURE 51 “ELAPSED TIME” START TRIGGER SETTING WINDOW....50
FIGURE 52 “DIGITAL LINES” START TRIGGER SETTING WINDOW....50

FIGURE 53 OPENING DIGITAL OUTPUT SETTINGS WINDOW 51
FIGURE 54 "SETTING TRIGGERS" WINDOW 52
FIGURE 55 DATA EXPORTING OPTIONS 54
FIGURE 56 SETTING CSV OPTIONS 55
FIGURE 57 CREATING A NEW PROJECT 56
FIGURE 58 SETTING PASSWORD FOR A PROJECT 56
FIGURE 59 "LOCK IDAQ" WINDOW 58

INDEX

A

Advising signs

Green "Acquisition mode ON" square 13

Green Storing square 44

Grey "Adquisition mode DISABLED" square ... 13

Light blue Hold square 41; 43

Light blue Locking square 58

Orange Recording square 44

Red "Adquisition mode OFF" square 13

Red No storing square 44

Red Read only Square 57

Violet Autoscale Square 41; 43

White "Remote connection established" sign 34

White "Remote source connected" sign 34

Yellow "Zero offset" square 41

C

Calibration

Angular channels calibration 20

Formula field for virtual channes 25

Frequency calibration 23

Linear position channels calibration 19

Pulses counter calibration 22

Configuration

Available Devices table 14

Calibration 17

Configuring acquisition device 14; 16

Configuring channels for XY 42

Used Devices table 14

E

Edit default connection credentials 33

Edit digital input lines 36

Edit digital output lines 37

Edit server connection credentials 33

Export data 54

Export image 54

Exporting data

Add legend 55

Color boxes 55

F

Folders

Exported data folder 31; 54

Project base folder 31; 57

Recorded data folder 31; 52

I

Installation 12

P

Projects commands

Close project 57

Closing project 57

Current name 13

Edit project 56

New project 56

Save project 57

Set Password 56

Protect your work

Lock iDaq 58

Protecting project 58

R

Requirements

Default client credentials 33

Default server credentials 33

Minimum hardware requirements 11

Minimum software requirements 11

S

Server address 33

Server port 33

Signal filtering

Bandpass filter 40

Bandstop filter 40

Highpass filter 40

Lowpass filter 40

T

Triggers

Triggers 45; 48; 49; 50

Triggers functionalities

"Start by user" default trigger 46

Arm all the triggers together 52

Arm triggers 45; 52; 53

Auto arm 47; 50

Disarm all the triggers together 52

Evalutating triggers 53

Log triggers 52

Start by user 52

Stop by user 52

Triggers 52; 56

Triggers types

Analog value in/out of range 48

Crossing a selected analog value 47

Digital line change 50

Elapsed time 50

Selected time 49

Start triggers 46

Stop triggers 46

W

Windows of iDaq

Acquisition channel window 39

Analog input signals table 16

Calibrate angular position counter window ... 20

Calibrate frequency measure window 23

Calibrate linear position window 19

Calibrate pulse counter window 22

Data distribution window 32

Data view window 41

Device settings window 15

Digital Output Settings window 51

Log window 30

Main window..... 13; 14; 38; 42; 57; 58

Trigger editor window 44

Triggers editor window 51

Virtual channel calibration window 24

Virtual signals tab..... 24